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# THE AMERICAN GAS LIGHT JOURNAL

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*The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.*


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[OFFICIAL NOTICE.]

### Cost of Proceedings, Western Gas Association, to Non-Members.

WESTERN GAS ASSOCIATION, OFFICE OF THE SECRETARY,
NEW ALBANY, IND., Sept. 29, 1899.

Bound copies containing the Proceedings of the Western Gas Association for the years 1896–97–98 can be obtained for the sum of $2 each. Make your remittances payable to the Secretary.

JAMES W. DUNBAR, Secy.

[OFFICIAL NOTICE.]

### Twenty-seventh Annual Meeting, American Gas Light Association.

GENERAL ANNOUNCEMENT.

OFFICE OF THE SECRETARY,
NEW YORK, Sept. 28, 1899.

There will be an annual meeting of the American Gas Light Association held at New York city, October 18th, 19th and 20th, 1899. The meeting will be called to order by the President, Mr. Alex. C. Humphreys, of New York city, at 10 A.M., Wednesday, October 18th, in the meeting hall, which will be in Sherry's new building, corner of Fifth avenue and Forty-fourth street.

The headquarters will be at the Herald Square Hotel, Thirty-fourth street, between Broadway and Seventh avenue. This is a new hotel, to be opened October 1st. All members should get rooms at headquarters.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed stamped envelope should be enclosed, as misunderstandings may thereby be averted. If you write before October 5th, address Mr. C. F. Wildey, Cosmopolitan Hotel, New York city.

The Herald Square Hotel will be conducted on the European plan, and rates for rooms will be as follows:

Rooms without bath occupied by one person, from $1.50 to $2.50 per day; rooms with bath, occupied by one person, from $2.50 to $4 per day. When room is occupied by two persons the total charge in every case will be $1 more per day than when the same room is occupied by one person; that is, $2.50 for $1.50 rooms, and so on. Members of the Association occupying rooms without bath will have the privilege of using the general bath rooms, with which each floor is provided, free of charge.

The roll call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name and address, etc., as these appear on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary. Remember, all applications must be in the Secretary's hands, by October 8th at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"Another View of Interior Illumination," by Mr. F. N. Morton, Hoboken, N. J.

"The Steam Consumption in a Water Gas Plant," by Mr. Alten S. Miller, New York city.

"The Pumping of Gas," by Mr. George J. Roberts, Phila., Pa.

"Carbureted Water Gas as a Coal Gas Auxiliary," by Mr. A. G. Glasgow, London, England.

"Some Experiments with the Edgerton Standard," by Mr. Rollin Norris, Philadelphia, Pa.

"Notes on Prepayment Meters," by Mr. Alexander H. Strecker, Newark, N. J.

A lecture will be delivered to the Association by Dr. Henry Morton, President of the Stevens Institute of Technology, Hoboken, N. J., upon "Recent Development of Artificial Illumination."

If the papers are of a sufficiently high standard the Beal Medal will be awarded to the author of the best paper presented; the question of which is best to be decided by the constituted Committee.

All questions for the Question Box should be sent to the Secretary as soon as possible, in order that they may be printed and mailed to members before the meeting, thus insuring their discussion.

During the days of the meeting all the announcements will be posted on the bulletin boards at the hotel and in the meeting room. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work by affording a ready means of recognition.

In order that the Year Book containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that if any of the speakers at this meeting desire to correct their remarks before they are printed they will be given an opportunity before leaving New York city, but not after. The stenographer will have type written copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned into the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted—viz., full fare going and one third fare returning—by the several Passenger Associations named and under the conditions noted:

The Trunk Line Passenger Committee, covering territory west of New England and East of Niagara Falls, Buffalo and Salamanca, N. Y., Pittsburg, Pa.; Bellaire, O.; Wheeling, Parkersburg, and Charleston, W. Va.

The New England Passenger Association, covering nearly all of the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis; in other words, the territory west of that of the Central Association.

[Here follows instruction by the Secretary as to the conditions under which the one and one-third fare for the round trip may be obtained. These conditions are practically similar to those that have heretofore obtained.]

SPECIAL.

Since many of the members will wish to see something of the city, it has been decided to hold only one business session each day, beginning at 10 A.M. sharp an continuing until 2 P.M. If the members will meet promptly and attend strictly to business it will be possible to get through with full as much of this as is usually done in the four shorter sessions, and at the same time have an opportunity for sight-seeing in the afternoon. It is hoped that the members will aid in expediting the business of the meeting by being on hand at the appointed time each morning. The President has announced his intention to call the meeting to order each day, at the time set, even though only a bare quorum is present.

If sufficient numbers of subscriptions are obtained the social programme will be as follows:

Thursday evening a banquet, to which ladies will be admitted on equal footing with the gentlemen. Friday, a steamboat ride around New York harbor. Tickets admitting members and friends to these entertainments can be had for $5 each. If you wish to join in them please sign enclosed card and return it to the Secretary at once. It will be necessary to have at least 200 subscriptions. Please send in your subscriptions at once, so that the Committee can tell whether they can go ahead and arrange for these entertainments.

Be sure to obtain a railroad certificate when buying your ticket for New York, as the greater the number of certificates handed in the easier it is to get the reduction in rates for future meetings. This is intended to apply especially to members coming from points comparatively nearby, such as Philadelphia, etc. Apply for ticket and certificate at least 30 minutes before train time.

Each person must sign his own certificate at time of purchasing tickets for New York. Be sure to hand the Secretary your certificate as soon as you reach the headquarters. Apply for return ticket at least 30 minutes before train time and have your certificate with you. All persons, ladies included, attending the meeting are entitled to the reduced rate from the territories named.

Members will please hand their certificates to the Secretary, or his clerk, upon arrival at place of meeting. If there are 100 members present holding certificates each certificate will then be properly endorsed, and handed back to owner before adjournment.

Keep this circular in your pocket and apply to it if you are in doubt.

ALFRED E. FORSTALL, Secy.

## BRIEFLY TOLD.

PRICES OF MATERIALS THAT AFFECT GAS MANUFACTURE.—We've been in receipt of several communications recently, the burden of which is that oil, so far as it is concerned in the manufacture or production of gas, sells at too high a price; but as the selling price of oil or of coal matters not to us, in that we represent the gas industry at large, we think the using-oil objectors are at fault. Time was, and it is not so long ago, when the gas man who bought a ton of gas coal, for frying in retorts, was considered a traitor to his calling; but time is that considers the gentleman who cannot operate a coal gas works just a trifle below his academic education. Too bad, that we cannot tell our fathers what they should have done; but having had bad fathers, let the sons try to better the footsteps of their progenitors. "After the war was over," in the United States oil was found to be useful, and its value has increased, in one way or another, ever since. For the past score of years we have been acquainted, and well, with the value in New York city of oil of various specified grades for use in the manufacture of gas; for another score of years prior we had been acquainted, and equally well, with the value of coal for like purposes. Now, however, judging from the tone of our correspondents' letters, who are mainly engaged in the manufacture of water gas, it looks that the price of oil is too high; but our same correspondents are seemingly oblivious to the fact that the price of gas coal just now is rather low. Yesterday oil had its innings; to-day it may also be able to score, and who shall prophesy for to-morrow? Suppose we take a chance in the lottery of commerce, so far as opinion goes. The coal beds are spread under comparatively shallow covers, the oil flows are encountered at depths; the former are steady at least, the latter are ill-regulated, especially in the sense of production, and so it goes, with the odds in favor of the coal beds, so far as usefulness for rationalness in gas making is concerned. It is not our fault that we speak for gas, although it is our glory to say that no electrical coal user on earth can supersede us in giving to the consumer, light unit per light unit, an illuminating value for his money equal to the value that he gets from the gas man. This seems, perhaps, to be straying a bit from the original point of starting, but the exordium was all brought about by the receipt of a letter from the great West, dated the 30th of last month. Suppressing titles and names, the remainder of the letter's text is this: "The Standard Oil Company has more than doubled the price of gas oil within the past year. The question as to whether this enormous increase in price results from ordinary laws of supply and demand or manipulation is a very important one to a large number of the gas companies. The Standard points to the price of crude oil in the field in justification of the advance in gas oil; but, as it makes this price, besides being itself the handler of most of the crude, it is a question whether this excuse can be accepted as legitimate. It is admitted that the demand for all other products of the oil refinery has increased, and that the prices of such products have been advanced. If legitimate profits are at all to be considered, this state of affairs should result in lower rather than higher prices for gas oil, the demand for which has not materially increased. The gas industry suffers more from such increase in prices than any other industry, for the prices at which water gas are sold cannot well be increased, while dealers in other refinery products are in a position to follow up the market. So, the burden, falling as it does upon the general public, is so widely distributed that no great hardship is worked in any case." So much for one correspondent's statement. The Company, which he well engineers, makes water gas; that system of manufacture may have been the best at the time when its promoters took the field, wherefore no cause for sorrow is his that the price of oil then is not its price now. There, however, is this consolation left to him, that if the price of oil is high the price of coal is low, so that his fear is not on a parity with that of the unfortunate who had to choose between the devil and the deep sea. In the latter connection it might be fair to remark that the devil that was is not the devil that is.

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NOTES.—The menagerie at Buffalo, N. Y., so far as the gas lighting interests thereof are concerned, seems to have been finally caged. The consolidated corporation is to be known as the Buffalo Gas Company, with the following Directors: A. C. Humphreys, Henry Seligman, Stephen Peabody, R. C. Pruyn, R. L. Fryer, B. C. Rumsey, Daniel O'Day, F. D. Locke, Chas. Berrick, J. A. Kennedy and W. S. Riselay. ——The new gas plant of the Santa Monica (Cal.) Electric Light and Power Company is well underway, so says a recent issue of the local *Outlook*. The plant is to be completed by November 1st, and our authority further adds that the new gasholder is "to rest in a wooden tank."

## A Commentary on Herr G. Liegel's Paper on Preventing the Thickening of Tar, with a Practical Illustration.

By Mr. Frederic Egner.

The intelligent and studious reader of Herr Liegel's admirable paper will be impressed by the exceedingly simple, direct and thorough manner in which the author has handled his subject. The cursory reader, on the other hand, will probably see nothing of interest in it, and may be something to excite derisive criticism. For what, it may be asked, is an average annual make of a little less than 8,000 cubic feet of gas per retort and day, when *we* get 10,000 or 11,000? Besides, everybody knows that when heats are high we get thick tar or pitch in the hydraulic main, and when they are low, we get more, and thin, tar with less gas. We are not in the tar business, and the quality of the tar, which is a drug in the market anyhow, does not bother us so much as how to get the greatest quantity of gas from the coal. To aid others in obtaining such desirable results was the object of Herr Liegel when he presented his paper, as he plainly tells us in the final sentence. Let us see if he has done anything which, applied to practice, would warrant such a conclusion. In this examination the writer will, properly too, no doubt, draw only on his own experience for comparison, and he hopes that his statements may prove approximately as useful as he believes Herr Liegel's to be. For the information of the unknown reader, and with not the remotest desire to be considered anything out of the ordinary, the writer may point to a certain period of his experience as a superintendent of gas works, when he obtained an annual average product, per retort and day, of 9,380 cubic feet of gas, with oval retorts 21 inches by 13 inches by 8 feet 6 inches, set five in an oven, fired by the old style, grate bar furnace, with 20 such ovens to a bench; or, as we call it in America, 20 benches of 5's to the "stack." The material used was coal yielding on an average 4.71 cubic feet of 17 candle gas, and with the coal a little oil as an enricher to bring the candle power up to 20, but all gasified in the retorts comprising the above 20 benches of 5's.

The preceding statement the writer admits leaves a little room for some "guessing;" but, as a much liked author would say, "That is another story." The averages of 9,380 cubic feet mentioned were, like Herr Liegel's are properly assumed to be, the gas made during the year, divided by all the retorts in action, in this case 100, the number of retorts in the 20 benches, thus including such as were scurfing, as well as when not working up to the maximum; in other words, "missing" charges, which occurred a few times. The writer has seen quoted yields of 11,000 and more cubic feet per retort per 24 hours, which were arrived at by deducting time lost for scurfing, or when from any cause whatever the retorts were not working up to full capacity. Such statements look big on the books, but deceive nobody but the man who is weak enough to his own hurt to deceive himself. They are absolutely without other result, because at the money end of the company the yield per retort goes for nothing, if the net cost per 1,000 made—and, yes, sold—is not equally good in fact. So that, as just stated, the superintendent may write down any "result" his special way to arrive at such figures may dictate, be it ten, eleven or more thousand per retort and day, without deceiving any but himself, and perhaps sometimes a credulous friend or two.

It is a thousand pities that we do not have an authorized method for arriving at such interesting data, where all, figuring upon the same basis, could then make *really useful* comparisons. But one man may tell you (to boost some particular method in which he is financially interested) that they make 70,000 cubic feet per man, at such and such a place, when it would be found that he meant, one man on the shift in 24 hours, and that there may be two and even three "shifts" in the 24 hours. Yet our interested informant has counted them all as one; one man at a time, you know. This is no fancy picture either. Such statements have been made to the writer by parties who were afterwards obliged to admit, after close questioning, the real state of affairs. It has occurred, for instance, when the performances per man with the inclined retort system were compared with results in horizontal retort benches. Speaking of inclines, brings me to a practical application of Herr Liegel's paper, which the writer desires to make with inclines as a part of the object lesson.

As inclines are likely to *command* the serious attention of gas men in the near future, a reference to the notable failure of these at St. Louis, in 1889–90, and the causes in part, may be of present interest and subsequent use to the reader. These causes will be only treated of in so far as Herr Liegel's lesson of recent date helps us to explain them, thus not diverging from the object of this "Commentary."

It is no more than fair, when referring to that notable failure, to mention that the inclined retort system has now been established and successfully operated for a number of years in Europe and is steadily gaining in favor wherever once installed.

It would be worse than a confession of ignorance on part of any gas engineer *now* to quote the St. Louis, and still more notable London, England (about the same time) failure, against that well authenticated successful great improvement in the more economical manufacture of coal gas. A bench of five inclined retorts had been erected at the works of the old St. Louis Gas Company, about 1887, and successfully operated for over two years. That bench was a copy of several like benches seen by the writer in the spring of 1897, at the gas works at Rheims, France, where, under the direction of M. Coze, they had when seen been in continuous action for over 1,500 days and were still doing fairly good work. The bench first mentioned encouraged the officers of the Laclede Gas Company to venture upon the erection of 8 benches, with 7 retorts to the bench, of the inclined pattern, but deviating very materially from the original design. It was the changing from the original plans which was the direct cause of the black eye given the system for so many years in this country. We introduced a regenerative furnace in connection with the inclined retorts. This was an untried innovation; but as that furnace was doing well with horizontal retort benches, why not then with inclines?

We built the benches as nearly back to back as we could, because it was good practice with horizontal retort benches, the only kind known to that date. It has since been demonstrated that that was a grave error with inclines; but our worst move was to do away with the long, thin, ascension pipes, shown in the original plan, and substituting therefor short take-off pipes at the rear and upper ends of the retorts. The reader will observe that such a course was diametrically opposed to what in these later days would be recommended by Herr Liegel, who has demonstrated and described why this should not be done in a measure, though he has not spoken of inclines at all. The primary and principal causes of our failure were the stoppages in take-off pipes and hydraulic main, occurring precisely as, and by the means, described by Herr Liegel. We of course could not see the accumulating evil so aptly diagnosed by the gentleman named, when all at once it was upon us. The furnaces worked well and were fully under control, and the retorts were evenly heated, until the destruction of the regenerators, caused by the sliding of the retorts, against which no provision had been made contrary to the advice of the engineer, put them practically out of commission. To prove that changing the short and upper end take-off pipes for the long and lower end ones caused the trouble, two benches were changed to conform to the original plan, which clearly demonstrated the correctness of that theory. The then President of the Company of the writer would not admit this, however, and wrote that it would doubtless be a long time before he could be convinced that the change mentioned made any difference; but that it did was self-evident to those who were on the spot. And now, after a long time, may the writer be excused for drawing upon Herr Liegel's clear cut statements about the preventing the thickening of the tar that it could be so? Many years since a paper was published on "Stopped Pipes," by one of our most respected fellow members. However, after telling us all that had been tried (and the writer followed that author in trying every one of his suggestions, all of which are also mentioned in Herr Liegel's paper), we were left without any practical remedy, pretty much where we started; but Herr Liegel leaves nothing in doubt, or without a reason for his deductions, which are further strengthened by his practical demonstrations.

If we do not use "English" or "Saar" coals, the line of reasoning and procedure is not the less clear, and is quite as applicable to Penn, Westmoreland, Yioughiogheny or any other kind of gas coal. Unless mistaken, it was Herr Liegel who first applied the principle of the regenerator furnace to gas works, and that alone ought to give weight to anything with which that gentleman favors the gas industry.

[Prepared for the Journal.]

## Care and Maintenance of Mining Machinery.

By Mr. G. D. Rice.

In the care and maintenance of mining machinery there are several considerations to be taken into account, some of which are:

1. The loss by the natural wear and tear of the machinery occasioned by the work and neglect or carelessness.

2. The addition to the value of the machine at any given period which results from effective repair.

3. The character of the work to be performed and its effect upon the construction, operation and amount of wear of the machine.

4. The loss of capital caused by a decrease in the relative value, owing to the introduction of superior instruments capable of more economical results.

While the working of a mining machine tends toward a diminution of its life, the repairs upon it from time to time tend to an increase of the latter. It is thus necessary to make some provision in the estimation of yearly value for the effect of expenditure on repairs. It should be borne in mind that the effect on the value, measured by an increased capacity of the machine for work, does not always coincide with the money cost of repairs. More money may be spent on the latter than represents the value added to the machine, for while there is beyond doubt an increase in value, it may not be equal to the expenditure. The general effect of repairs is, however, to extend the life of the machine; and, looked at merely from the standpoint of wear and-tear, they should be charged as an offset to the depreciation in the year when they occur. On the other hand, extensive repairs when the machine is old do not affect the question of its comparatively diminished value in view of improvements made in the design and construction of similar machines during its life. This is a factor to which it is impossible to give any definite yearly value, but it is one to be reckoned with, nevertheless. It can only be taken into account properly by adding periodically a special charge, but it is met to some extent by the decreased value of the machine arising from the operation of the regular charge.

*Disintegrators and Pulverizers.*—In the caring for and repairing machines for reducing clays, iron ores, coal, etc., mechanical skill is essential. In some forms of machines the motion is obtained by the crank, to which is fixed a spur-wheel gearing into a larger one carrying a crank pin attached to its side; to this pin the connecting rod is attached, the upper end being connected to a projection in one of the horizontal levers mounted upon the rocking shafts. The levers are connected in the middle by a pin upon which they are free to move by the rocking shafts, and also moving the upper extremities of the vertical lever through the given arc of a circle. The extremities of the levers are slotted and have the usual lateral movement each direction. Beneath these levers are mounted two cams operated direct from the crank by beveled gearing upon the vertical shaft and the ring and star wheels. The international cam is a curve, so that the movement of the sliding frame causes it to elevate and depress the levers, having their fulcrum in the center. Thus a positive direct movement obtains throughout.

The oiling of the machine is important. The waste of oil in mines in connection with vertical shafts can be easily prevented by a simple contrivance. A brass flange or disk, ¼ inch in diameter, flat on the under and convex on the upper side, has a hole through its center of the required size, and is driven on the lower end of the shaft until it fastens on the taper part, about ⅛ of an inch higher up. A metallic dome of about ¼ inch diameter, and rather less in depth, with an aperture at the top of $\frac{1}{16}$ of an inch, is placed on the shaft before the flange is attached, and its top covers the top of the flange, while its edge or lip fits loosely in the dish of the footstep. By this means waste cannot accumulate about the shafts at the footstep, and the oil that rises upon them is thrown from the edge of the disk, and runs down within the dome to the footstep again, thus effecting a saving of oil and labor.

To keep the parts of the machine clean and in good order, use cleansing paste, the ingredients of which are: 20 parts of liquid cocoanut oil soap, 2 parts Tripoli powder, 1 part tartaric acid powder, 1 part of white lead. Mix all together in a mortar.

*No. 2.—Polishing for Metals.*—Ingredients: 8 parts of carbonate of magnesia, 8 parts of chalk, elutriated, 13 parts ferric oxide (red oxide of iron). Mix all together by sifting several times through a fine sieve.

*Elevating and Conveying Machinery.*—There is absolutely no economy whatever in running a worn pulley in an elevating or conveying system. If a pulley fails to run, look for some unbalanced part; perhaps the ring is loose or is not set level. The traveler may not fit the ring properly, for both this and the ring may be worn, or there may be deflections from its normal course which will increase the tension and continually break down the system, as in case the spindle is not in the center of the ring or the guide wire properly adjusted.

In the older arrangements for getting a tension, the lower extremity of the upright backing-off rod is kept pressing against the back extremity of the long backing off rod. The extension of this long rod further back has made it necessary to fit a stud in the long rod for the upright rod to abut against. This stud serves the purpose of assisting in the disengagement of the backing-off friction at the proper time, and of keeping the same friction well clear during the running of the cable. There is, of course, the usual connection from the strap fork lever to keep the backing-off friction disengaged until the proper time when the long rod is charged. These alterations also allow the long lever to only have two movements instead of three.

*Stamp Mill.*—Setting the shoe too far back on the central shaft of a stamp mill changes the force of the ball upon it. The curve of the incline might as well be changed completely. Supposing that the curve of the shoe was simply a part of the circle described by the ball as it goes round, it can be seen that to turn it in such a shape as to bring it slightly contrary to this curve of the ball will admit of the ball being able to push it downward to some extent. Now, turn it so that the curve described by the ball will fit into this similar curve of the shoe, and it will not touch it, but will roll inside of this circle because it is a counterpart of its own. So the shoe, being set too far back, gets too near to being like the circle of the ball, and consequently it loses force on it. No matter what the connection may be, the shoe should first be brought in a position to have the ball measure the whole of the incline of the shoe, so that the full effect of its changing curves may be had.

*Grinder.*—When properly made the cylinder of the grinder should run easily enough to make it possible to readily turn it with one hand. After the grinder has run for a while, say three or four weeks, or something less, it is natural to suppose that it should become dull, and then it would seem that drawing up on the screws would be in order, but as we hold that this should be postponed as long as possible, we find that at this stage it is of more advantage to remove the cylinder and true it than to draw the two together; but if it should be deemed more expedient to draw up on the screws in back, let it be done carefully all the way across, and not, as some do, by simply drawing up on the screw nearest the place where the dullness shows itself. The practice of doing this is wrong, and tends to get the blades uneven in a short while, when it will take much trouble and also much blade to rectify the trouble. This is one of the reasons why a straight edge is indispensable with some when grinding, and when a straight edge is a useful and convenient thing to have, it should never be made "necessary" by our treatment. We find that by putting off the drawing together of the blades as long as psssible we do better work for a longer period than can be done in any other way, and can truthfully assert that we have use for a wrench only once in a very long while.

Another very important factor for our notice is the amount of weight upon the rollers of the winder in relation to the substance passing through them, as having a great bearing upon the correct positions of the rolls. The weighing of this matter will be found as strictly essential as material. How often do we find, at the present time, the same amount of weight is left on the rolls when the substance passing through them varies 100 per cent. to 200 per cent. in area.

Such a violation of the true science cannot but work injuriously upon the product. If there was sufficient weight for the coarser amount it must be excessive for the lesser quantity, and the effect of overweight upon the materials is to impart their mechanical structure more or less accordingly. This lowers their properties and detracts from the quality of the product. If, on the other hand, the weight is just sufficient for the finer substances, it must be inadequate to the larger mass without some alteration in the position of the rolls. We are thus enabled to see that this question is one that should enter into the deliberations of the mining overseer when occasion calls for readjustment of the rolls.

The oiling of bearings, both top and bottom rolls, also requires constant attention, and good work cannot be expected if these are not kept clean, well oiled and perfectly free in their bearings. All other parts of the machine must also be kept well oiled so that they will perform their respective functions. They must also be scoured at regular intervals, sufficiently frequent. In fact this machine, simple as it is in its parts, is one that requires a great amount of care and attention, and if such is not given it will cause more bad work, which will have its effect upon the product oftener than is expected.

*Hoisting Engines.*—In setting the engine valves it is necessary to first open the port; and, in the second place, it should be held open until ready to be closed, when it should be closed quickly; and, third, closed at any point in the stroke. It should continue closed until the piston reaches the end of its stroke, when it should open again and allow the steam to escape from the cylinder as quickly as possible, and with the least back pressure, and this port must again be closed early enough to allow the steam that has not escaped to be confined and compressed by the advancing piston to take up the motion of the moving parts and ease the engine over the center. The single valve must perform these four functions for each end of the cylinder. Of these functions all are important, and, with a late and fixed cut-off,

the common slide valve performs them very well, but does not admit of an early enough cut-off for the best use of steam. In a simple slide valve engine the steam admitted is throttled to fit the load. To cut off earlier in the stroke there are three ways besides a drop cut off, viz.: To change the travel of the valve, to give angular advance to the eccentric, or to combine the two, giving the eccentric both angular advance and a change in the throw of the eccentric. As there are a number of ways of changing the valve there must be a number of ways of getting it out of order. There is an opportunity to adjust the valve cams and eccentrics by means of set screws; the valve stems may be lengthened or shortened; the cut off pin can be moved; the gear driving the valve shaft may be placed a tooth forward or back; and all these, designed to adjust each part by itself, may in careless hands be used to get the engine all out of kilter. The same trouble comes here in the setting of the valve by marks. The marks are placed on a hub near the shaft, and the motion to the valve given from the extremity of a lever, so that a very slight departure from the direct coincidence of the marks means a great deal of difference at the valve, for the slight difference is multiplied by the length of the lever. In setting by marks, therefore, make very sure the marks are absolutely in line. The pressure to be carried on a single engine is affected by condensation. Where the load is not heavy enough to require it, a cut-off of one third from a boiler pressure of 60 pounds will give the best practical result, and better than a shorter cut-off at a higher pressure, say 90 pounds. For a compound, a pressure up to 120 pounds may be carried, with nine expansions; for a triple expansion engine, a pressure up to 200 pounds, giving 27 expansions; and a quadruple expansion engine, as high as 800 pounds pressure may be had, giving 80 expansions.

Most engine builders provide their engines for indication. Others do not. If the cylinder is not so provided, the cylinder must be drilled to receive a half-inch pipe, in the clearance space, or somewhere where the piston will not cover the hole at any portion of its stroke. In drilling great care should be taken not to let the cuttings get into the cylinder and that the cuttings are cleaned from the holes. This is done on each end, and the holes then tapped for common half-inch pipe thread. Before drilling it is best to have the reducing motion settled upon, and then drill to have the motion and indicators come in line. If the reducing motion comes on the side of the engine, then the cylinder may be drilled on that side. If not, then the cylinder must be drilled on top. Guide pulleys should not be used if it is possible to avoid them, and the cord must always pull in line with the reducing motion in the same plane of its movement.

There are oils used by the trade which are of no practical value except to clog up the rollers of engines. Olein is a product of an oily nature in use in some mines for lubrication. Olein is the chemist's name for a body formed by the union of glycerine and oleic acid. This body is extracted by pressing from tallow, and is obtained as a clear oil with a yellowish tinge. This product, if pure, is the true olein, specific gravity about 0.917 at 60° F., insoluble in spirits. The fat formed by treating wool grease with alkaline lye is dissolved in water and filtered. To this a solution of alum or other alumina salt is added, whereby a brown precipitate is formed which is called "aluminum lanolate." With this substance, when dried, lubricating oils of any viscosity may be produced by dissolving it in any fluid mineral oil. If dissolved in a small quantity of mineral oil, a gelatinous substance is obtained which may with advantage be mixed with india rubber or gutta percha. The quantity of free fat can be found by using the dried out residue that remains after the water is evaporated in the heated oven, and placing it in a fat-extracting apparatus. After extracting for an hour or so with petroleum ether, and then evaporating off the ether, the residue of free fat can be weighed. Now, if a good oil is used there is the proper application to be considered. Every part of the machine should be provided with necessary oil cups and these should be carefully attended.

[Concluded from Page 575.]

## The Problem of Municipal Ownership.

By Mr. Martin A. Gemunder, of Columbus, Ohio.

During the last few years the cry has gone forth for "A business administration." Some years ago our city elected a business man to the office of Mayor. He was a gentleman of means and standing in the community, who took the office from a sense of duty only. Upon assuming his duties he found a woeful difference between being a public executive and a private one. He found his hands tied in every way by law and ordinance, prompt and independent action being everywhere blocked. One day he turned to me and said, with every indication of strong irritation in his tone and manner, "Business methods, indeed! How long would my own private business progress if I were compelled to consult nineteen partners every time I wished to buy a load of hay?" And this was meant with no discourtesy to the legislative branch of the city government. It was simply an outburst of vexation at restraints placed upon conduct to which he was not accustomed as a manager of large private interests.

If a city is to undertake the conducting of everyday business enterprises and measure cost of production with private organizations, then it becomes imperative to so change the laws as not to leave its officers working under such a tremendous disadvantage as compared with their outside competitors.

Our democratic form of government, which I believe to be such a good one for doing that which a government ought to do, that is, securing to the members of the community their just rights, is, in my humble opinion, a flat failure when it undertakes to enter the mercantile arena. That sort of thing may thrive fairly well under a monarchical form of government, where, as for example in the city of Glasgow, "It is the almost uniform practice to appoint as permanent chiefs or superintendents of departments the most thoroughly qualified men who can be secured; * * * at the head of police, fire, water, gas, cemetery, park, engineering and other departments are to be found men of special fitness and training, who are selected for administrative ability as well as for expert knowledge, and whose security of tenure, for so long as they deserve it, adds to their faithfulness and usefulness. * * * It is usual to advertise a vacancy; and the committee most directly concerned make their choice from the applicants, and then recommend to the full council for action. If a chief of police is wanted for a town even of moderate size, there are likely to be applicants by the score or hundred from all parts of the United Kingdom."

One can readily understand how under such conditions a good and stable public service may be created and maintained, that would in a manner approach in efficiency private management. But under our system of short terms and constant change, where elections, appointments and removals are constantly taking place for reasons having no bearing whatever upon the real points at issue; where the appointment of a superintendent of public lighting, or an inspector of garbage and sewer traps and the like frequently hinges on whether or not the applicant declares a belief in crime of of '73 and kindred irrelevant issues; where costly deadlocks, due to partizan differences between executive and legislative branches of the government, are not only possible but the order of the day; where, in short, that skill and usefulness which arise only in the school of experience are not taken advantage of; where character and ability in an officer or clerk are matters of secondary consideration; under such a system of administration the widening of the scope of the government's duties by making it a purveyor of merchandise as well as guardian of the peace will surely sooner or later prove to be a serious error.

Removing industries from channels wherein the penalty for bad management is extinction, and placing them in hands where there is practically no penalty at all, means in the end a decided loss to the community. I will venture the statement with considerable confidence that there is not a public executive in this audience who does not honestly believe that if he were placed in full charge of his city's affairs, given the same tenure of office and plenary powers as is, for example, given the president of a railroad by the stockholders; in other words, if he were permitted to conduct the city's business as he is permitted to conduct his private business, he could give the city a more effieient service than it now receives at a reduction of from 10 to 20 per cent. in outlay.

Here, however, I can imagine a rather impatient interruption. "Granted," it will be urged, "that there is waste in the public servi e even to the extent that you allege, yet on the other hand the exactions on the part of private corporations are so unfair and onerous as to more than make up for loss sustained by reason of the comparatively inefficient public service." Or, to use the words of Professor Bemis: "Whatever else may be in doubt regarding municipal ownership, it is clearly established that charges to ordinary private consumers are less under that system than under private ownership." It is quite confidently asserted that actual experience shows that where municipal plants have been installed the cost to the public and to private consumers has been reduced. By way of proof we have submitted the usual list of costs under municipal and private ownership. It does not seem to occur to the gentlemen presenting these lists that municipal accounting is as loosely carried on as is any other branch of city work. Skilled ac-

countants are rare in public offices, and even when they are obtained they are seldom held for any length of time. There is little risk in stating, after looking over the lists of municipal plants, that in many if not in most of their offices a double entry book is unknown. Take up almost any of the published annual reports, whether from large or from small cities, and you will notice little that resembles the balance sheet, which is turned in for the inspection of any private board of directors. Almost invariably these reports are only long lists of receipts and disbursements in detail with but little attempt at generalization. I have still to see the first city report, and I have seen many, that shows any outstanding liabilities other than bonds and notes, or that gives a clean statement as to how the municipal corporation stands as a whole.

Some years ago I had occasion to examine into some reports published by the State of Ohio as to the cost of making gas at the State's plant. Figures were published and spread broadcast which were so low as to cause many a private corporation to squirm. I examined the plant itself as well as the published reports. The most astonishing thing connected with the whole affair was the admission on the part of the superintendent that for some times six months at a time no records at all had been kept. The State possessed no station meter or other meters to speak of and about everything was guessed at. It was therefore no surprise to find the official report showing that the output exceeded the amount of gas made. With revolutions in the political wheel came also changes in superintendents. One of these complained rather bitterly as follows: "Notwithstanding the fact that I expected to find the works in a bad condition, I certainly did not expect to find them in such a dilapidated state as I did. There were no retorts in the works fit for use; in fact, about everything had been exhausted and nothing replaced that could possibly have been avoided—I suppose in anticipation of a change in administration. I am satisfied that the expense of making these necessary repairs, and to enlarge sufficiently to meet all demands, would be equally as much, if not more, than to build new works with capacity to meet all requirements for years." A further inspection showed that the lowest cost was reported by the superintendent who had let things go to ruin, and as soon as the works were in good condition, strange to say, the cost rose about 25 per cent. Evidently no trustworthy invoices were taken.

Of course I do not mean to be understood as holding that all municipal plants make as inaccurate returns as did this State plant, nevertheless the conditions which permit this loose method of accounting surround all city governments as carried on to-day. Reports to private directors must be at least approximately correct. Managers must know what they are doing. Their means are limited and losses cannot possibly be shifted on others. One may therefore rest assured that the charges made by private concerns are in fact all that the service costs the consumer. On the other hand, when a municipality reports as placing on the market any service at a given figure there is no assurance whatever that this figure represents the real cost.

On November 21, 1898, in the city of Springfield, Mass., my native city, by the way, the committee on lighting streets reported in part to the board of aldermen as follows: "The committee on lighting streets, who were directed to investigate and report on municipal lighting, respectfully submit the accompanying report, after a most careful and thorough investigation. To aid us in our investigation your committee sent out a list of questions to cities employing the municipal plan and to cities buying their lights from private corporations. Out of 50 circulars sent to cities contracting from private corporations we received thirty-four replies, which were tabulated as shown by attached table. Out of the same number of circulars sent to cities using a municipal plant only eleven replies were received, and the answers were so indefinite that a more concise list of questions was sent out, and to a second circular we received seventeen replies. These were tabulated in the same manner as those from cities with private plants, and the copy is attached. We found the answers received from municipal plants very unsatisfactory, and we must say, in some cases inaccurate, as the answers received from one city were very different on the two circulars sent, and we are advised that on four requests for information similar to our own no two were alike. This arises principally from the way in which the cost is figured, but the result is very unsatisfactory and misleading."

This unsatisfactory condition of public reports and statements is not necessarily to be attributed to intentional dishonesty or attempts at misleading, but to loose systems of accounting and the laxity in method that seems to be the concomitant of public work. I can hardly conceive it to be possible that any one having any familiarity with private corporation work, and at the same time knowledge of how public affairs are conducted, can place any reliance whatever upon the statements of alleged cost furnished in the general city reports. I should certainly advise any one who desires a knowledge of the real state of affairs to hold such reports with a very light hand. The tables of cost presented are not by any means to be taken as proving the advantage of municipal ownership, nor are they to be accepted in evidence unless the statements have been verified by parties competent to carry on an investigation. I have reasons for believing that no such verification has been undertaken to any considerable extent.

Before drawing conclusions a few remarks concerning franchises and their values would not be out of place. On this subject, although much has been said and written there seems to be little really understood. One would be led to believe from the very generally expressed opinion that a franchise is a something at the disposal of the community for which almost any amount of remuneration can be exacted. Such a notion is certainly a very mistaken one, as the value of any particular franchise is susceptible of quite accurate calculation. Granted that a municipality has the power to collect in return for franchises given large sums of money, there are still questions of equity involved which make such demands for remuneration matters of a doubtful propriety. A grant of a franchise, of the kind here under consideration, is merely the grant of the right or privilege of using the public highways for supplying the community with some merchantable commodity or rendering it a service. Any one has, of course, the right of using these highways for delivering merchandise who chooses to do so, and without any need of securing a permit. A special permit is only required when such delivery necessitates the permanent appropriation of some part of such highways. An electric light, gas or telephone plant is in reality no more of a "public service corporation" than is a foundry or an ice house. The former industries have received a particular designation only because of the peculiar conditions under which a delivery takes place. The so called public service corporations differ from other corporations only in the following way: If a foundry delivers wares to a customer it is a matter of little or no concern to outside parties. The public service corporations, however, in dealing with certain individual members of the community, by their permanent appropriation of public property, encroach more or less upon the rights and freedom of third parties. It is therefore necessary that the community as a whole regulate to a certain extent the manner in which these industries are conducted. Disinterested third parties should be relieved as much as possible from all annoyance and expense. What now should the city exact when it grants a franchise? How determine its value?

Perhaps the best way for getting at the value of a franchise is by using as an illustration bond values. The amount of premium a bond will bring in the open market, assuming the city behind it to have good credit, is determined mainly by two items: First, the rate of interest; second, the length of time the bond has to run. Long time bonds as a rule are preferable as an investment and will consequently bring a better premium than short time bonds. The main determining factor, however, is the rate of interest. If an investor has ample opportunity for placing his capital at 3 per cent. for a reasonable length of time, then it becomes plain that a 3 per cent. bond would draw from him no bonus or premium whatever. If a municipal bond bears 4 per cent. on its face value, and is a 20-year bond, an investor seeking to place his money on a 3 per cent. basis will offer a premium of 14.96 per cent. If the bond bears 5 per cent. he will increase his premium to 29.92 per cent. If the bond is a 6 per cent. bond the premium rises to 44 87 per cent. and so on. The higher the rate of interest the greater the bonus or premium. If, on the contrary, he can find ready investment at 5 per cent., a city bond at 3 or 4 per cent. could only be floated at a discount. The city is always in a position to regulate the size of any premium by the control it has over the rate of interest the bond is to bear.

We have exactly the same state of affairs when a bonus or a payment for a franchise is under consideration, with this difference: Bond interest being a fixed rate of profit, premiums can be calculated with accuracy. In the mercantile business there is a greater factor of uncertainty due to the lack of positive assurance as to just what the gains will be. We have here an element of risk for which a proper allowance must be made by way of safety. As in the bond issue the rate of bonus a franchise will bring is determined partly by the length of time the franchise has to run, but mainly by the profits that the industry will yield. If good municipal bonds netting the holder 4 per cent. are plentiful, then it is certain that when a city grants a franchise, say for a street car line, it so fixes the maximum fare to be charged as to net not to exceed 4 per cent. on the investment, the franchise will hardly find a taker at par; at least if there is a premium offered it will be a

small one. Fix the maximum fare at such a figure that the net yield is 6 per cent., then if investment is sought at 5 per cent. a bonus will result. The greater the promised returns on the investment, the greater the bonus, or, so to speak, the greater the value of the franchise.

One thing now becomes very apparent, and should always be borne in mind, that in the franchise question exactly as shown in the bond issue the city authorities have the power of regulating the size of the bonus or franchise payment in their manipulation of the rates allowed to be charged. The higher above normal these charges are fixed, the greater will be the bonus. It will also be well to remember in this connection, the greater the bonus the greater the sacrifice the consumer is made to undergo for the benefit of the taxpayer. On the other hand, the lower the maximum charges permitted the smaller is the value of the franchise. Franchises floated at a discount sacrifice the taxpayer to the consumer.

According to my mind, the ideal franchise grant would be one which fixed rates to be charged at such a figure as to reduce it substantially to par. No bonus or payment would be forthcoming; at the same time the best interests of the consumer, who after all is the real person to be satisfied, would be subserved. Whenever a franchise is granted and a large payment is exacted as one of the conditions of the grant, then it is very evident that the city authorities have not been mindful of the interest of the consumer, but have compelled him to shoulder, in addition to paying market rates for his franchise, an extra share of the public burden.

If municipal officers when they undertake to grant a franchise or to enter into a contract with private parties for furnishing certain services to the city are alive to the situation, or, in other words, if they understand their business; if they have what they should possess, a reasonably accurate knowledge of what it costs to place these services on the market, they can stipulate such a maximum rate of charges as will allow only normal earnings on a bona fide investment of capital; this means that I and I′ are practical equivalents.

Returning to our original equations, we find that when a city has made proper contracts, as above described, the quantities I′, T′ and N′ would equal the quantities I, T and N. This would leave quantity E′ still in excess of quantity E, which excess would be equal in amount to the difference in efficiency between public and private management. Consequently X′, representing the cost to the consumer under municipal ownership would exceed X or the cost under private management, by exactly this same amount. This indicates that the tendency for best results lies with private ownership and management.

Investigation does not show that municipal ownership brings into play any heretofore latent factor for cheapening production. On the contrary, it shows that each and every item, including profits which go to make up the one of costs to the consumer under private management, must also be allowed for and to the full extent in computing the cost under municipal ownership.

Generally when a city has a problem of plant ownership up for consideration, conclusions are arrived at with not a tithe of the consideration being given it that would have been given had the investigating gentlemen themselves been requested to sign the subscription list in their individual capacities. The usual course is to refer matters to a committee, seldom composed of experts. Printed reports are reviewed, and perhaps a trip is undertaken to one or two cities owning and operating a plant. The inspection is superficial and off-hand statements by employes are taken without question. At times estimates are submitted by experts as to the cost of construction and probable running expense. These experts are generally one of two kinds. Either they are gentlemen interested in the sales of machinery or they are professors or engineers with no practical knowledge of public work. In the latter case the figures are usually honest and reliable, as far as the cost of the plant goes. Where the estimates go wrong is when it is presumed to indicate what the number of officers and employes will be and the size of the pay-roll. Estimates from this source would, I suppose, be approximately correct for guiding a private investment, but when it comes to applying them in public lines they require correction by local bosses.

In order that a community may be well served at private hands; in order that proper contracts may be entered into, it becomes a matter of necessity that public officers be placed in a position to go at the matter intelligently. I would therefore recommend that in the future no franchise be granted or contract awarded to any private corporation of the kind here under discussion that does not provide as a condition of such grant or award, the filing of a certified statement with the proper officers of the municipality. This statement shall be filed at stated intervals of time, detail the assets and liabilities of the concern, the receipts and disbursements, also such other data as will be needed for drawing correct ideas of the cost of the service. The right should also be reserved to a city of verifying these statements at any time from the books of the corporation. These statements would somewhat resemble the reports now made to State commissioners of railroads and telegraph. They should also be published in the daily press as are our bank statements at the present time.

Without statements of this kind to serve as a guide, a city council or a contracting municipal officer is utterly at sea when he undertakes to provide for the wants of his community. Without proper data public officers are utterly helpless. The making of a contract becomes a sort of a grab game in which both sides take a hand, and there is always great danger of injustice resulting to one or the other of the contracting parties. If after such precautions have been taken private concerns still receive more than their just share, then the fault lies not in the fact fact that the industry is not run by municipal agents, but that the communities' interests are.

Under our peculiar form of government and the very general apathy shown by so many of our best people toward assuming the duties and responsibilities that good citizenship implies, a state of affairs that in all probability will continue for generations to come, betterment lies not in the widening of the scope of government, but rather in its restriction. After an experience both in private and public corporation life, covering over a quarter of a century, I should give in answer to the question —should a municipality own and manage these so-called public service corporations?—a decidedly negative answer. As I read and decipher the problem, the public will be best served by enlisting in its service the skill and economy that accompany private management. An equitable contract with private parties promises the best results.

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[From *Engineering*.—Continued from page 572.]

## American Competition.—No. II.

[By Mr. George Howell, F. S. S., London, England.]

The question of foreign competition has been discussed almost *ad nauseam* during the last fifty years, and more especially during the last five-and-thirty years, but the theme is not exhausted. It requires to be re-discussed again and again until we are able to see it in all its aspects, stripped of all gloss and coloring, and free from prejudice and fear. Many persons insist that all the mischief arose out of the Great Exhibition of 1851, when, it is supposed, we gave ourselves away by letting the foreigner into our secrets, and publishing them to the world. This view cannot be sustained. On the contrary, we were then able to see for the first time how other nations were nearing us in the industrial race. In our insular position we had fondly cherished the idea that England was the workshop of the world, and we thought that she would so continue to the end of time. Other nations could grow, or otherwise produce, the raw material, but it was the general conviction that England alone could fashion and manufacture it for use. At one time this was practically true, but in the natural course of things it could not go on forever. We had to face the fact that all other nations and peoples could not remain stagnant whilst England alone progressed.

The laws of nature, and of evolution, forbid this. Besides, we ourselves rendered monoply impossible by the exportation of our machinery, and the migration of some of our best and most skilled artisans and mechanics, to the United States, to Canada, and to Australia; and many of our best workmen found advantageous situations in the workshops of France, Belgium, Germany, and other parts of Europe. Even had this not been the case, other nations were bound to advance by the laws of civilization, by reason of intercourse, and the expansion of trade. Each had to learn from the other.

Perhaps one of the chief reasons for our early supremacy in certain branches of trade was our almost perfect system of apprenticeship, which came down to us from the old guilds. Families and even districts became renowned for certain manufactures, and our ships carried these to the uttermost parts of the earth. Even when the apprenticeship system relaxed, and in some industries disappeared, its influence was felt—is even now felt—in trades where it had been rigorously enforced. There remained the training in the factory or workshop, the parents taking care, as far as possible, to find places for their children under their own eyes. The misfortune was, that for a long time we did not institute a system of technical instruction to help to compensate for the loss of special training of the apprentice. Prussia, Saxony, France, and perhaps Belgium and Switzerland, gave greater educational

advantages to the young than England did, which the slower German and the more adaptive Frenchman were not slow to profit by, both as regards elementary education and technical instruction. Later, America took a leading place in this respect; and as early as possible after the Civil War, special attention was given to the labor question, a Bureau of Labor being established in some of the States. The Government took care to obtain and circulate information concerning the state of trade, its progress and development, both in the States and in Europe. We lagged behind, however, until attention was called to it by Messrs. Creed and Williams, some thirty years ago, after visiting the engineering and iron works in Germany and France. Our educational system is not yet thirty years old, though the "Committee of Council" was established in 1839, but the progress was slow until 1870. Since that date advance has been rapid, and we can now be scarcely second to any country in our provision for education—elementary, secondary (after a fashion), and technical instruction. Certainly we need not fear foreign competition from neglect of education, though we have yet to make up for lost time.

England lagged behind in another important particular, and especially so for a great industrial country, namely, in our Patent Laws. For many years these laws were rather a stumbling-block and a hindrance; they made it most difficult for the poor inventor, and great inventors have mostly been poor. In other countries, notably in the United States, the Patent Laws gave encouragement to inventors by making it easy for them to obtain the protection required. We fol lowed but slowly in this direction, first of all by giving a limited pro tection to exhibitors at workmen's and other exhibitions, then by a reform of the Patent Laws generally. Obstruction and expense cost us dearly, for the "foreigner" shot ahead of us in many things. In respect of our Patent Laws we now have little cause for complaint.

Then it must be admitted that "we Britishers" have our prejudices, and so strong are they very often, that we stubbornly stick to old methods when newer and better ones have been discovered. This is true of us as a nation, so that no section can well blame the other. Perhaps in no country, except possibly in Asia, has there been a more decided opposition to changes, industrial as well as political and social. This was manifest in the opposition to, and even destruction of, machinery in the earlier stage of its development; and it can scarcely be said to have died out yet. We can understand the fierce opposition of the hand-loom weaver, for the loom was the breadwinner of the family in the textile trades.

The same feeling was manifested by the innkeeper and coach proprietors towards the railways, the opinion being that all would be ruined, and horses be of value no longer. In later days the tailor objected to the sewing machine, the shoemaker to the machines used in his branch of trade, and the agricultural laborer to agricultural machines now used in farming. All were wrong, as experience has shown, but the feeling is not obliterated. It is found to exist where ever some new labor-saving appliance is employed.

One would have thought that, with the vast progress of invention and the development of industry, all opposition to the introduction to newer methods would cease. But some recent events in the labor world would imply that it has not ceased, in spite of the fact that wages are higher, the hours of labor fewer, and the whole condition of the working classes better than it ever has been in the history of this country. Work also is more plentiful, good craftsmen being at a premium, in stead of a drug in the market. Then, in consequence of machinery, clothing is cheaper, and so also are most of the articles of daily use. Notwithstanding all this, there are to be found many who think that machinery spells ruin to the working man. It is singular how some times even the makers of machines—the operatives, not the employers—appear to take sides against machinery in a labor struggle. When machinery was first used in the boot and shoe trades, the largest subscriptions for the men came from the engineers, themselves makers of machinery, though, in that case, the machines came from the United States, as did the sewing machine. The "Coal Whippers" and "Ballast Heavers" of the Port of London, and other workers on the Thames, have barely given up their opposition to labor-saving appliances for the loading and unloading of ships. The same is true as regards the drilling machine in mines and quarries. The people have not realized the fact that opposition is futile; that it rather stimulates, than retards, invention.

Nor do they understand that our position as an industrial nation, and our advancement as a people, depend upon machinery and mechanical appliances quite as much as upon the character of the workmen. The nation that takes the lead in inventions, and their use in industrial undertakings, will also take the lead in manufacturing industry. If we fall behind in the race, the fault will be ours. This fact is slowly being forced upon our notice by the strides made in the United States, in Germany, Belgium, France and elsewhere.

Perhaps a good deal of the active opposition to the use of machinery might have been averted if, when at first introduced in any industry, the employers had tried to make the change as easy as possible for the workers. Sometimes this may have been difficult, sometimes almost impossible. In some cases the change arose out of a dispute, due to an independent cause, in which case there would be little disposition to negotiate. In a recent case, a great change has been effected with very little friction, and that, too, in a trade fairly well organized, namely, the compositors. There had been severe contests formerly over the use of machinery, especially with the *Times*. But no great revolution came until the invention of the Linotype machine, and it was a question at first whether the men would not, as a body, oppose its introduction. Fortunately, the secretary was able to take a broader view, and his council agreed with him. The result was that terms were made whereby the change was effected with very little friction. What was done in this instance might be done in others, by friendly negotiation; so that the displacement of labor should not be felt oppressive to the workers or injurious to their interests.

One of the complaints now made is that the men try to limit production by the machines they work. This may be as disastrous as opposition to the use of the machines. In the case of speed, the question of safety comes in. Employers and employed alike are bound to consider this point, so that safety to life and limb shall be insured. But that is quite a different thing to the limitation of output, which is a question f social or industrial economics. Common sense and reason will quickly see where undue severity of labor is required, or where the opposition is in the nature of limitation of production. Sloth in an individual worker may not amount to much in the shape of loss; in a machine it might mean a good deal.

The keenness of foreign competition is now such that greater attention than ever must needs be paid to mechanical inventions and improvements, and also to the organization of industry in our workshops. The state of trade, as shown by the comparatively meager lists of unemployed in the labor unions, shows that we have been, and are, holding our own fairly well in the industrial race. But it is manifest that we have able competitors on the Continent and in America. The late Mr. Trow's visit to the iron and steel works on the Continent, the late Mr. Inskip's visit to the United States to examine the boot and shoe trades, and Mr. Barnes' recent visit to the German workshops, show that the workmen are becoming alive to the fact that we have to face a keen competition. The more the labor leaders know about the matter, the better it will be for labor. They will see the direction in which industry is trending, and will be able to give practical advice to their constituents. It is often the case that workmen alone are blamed for the alleged falling off in trade, but employers are also sometimes to blame. The foreign and colonial reports issued by the authority of Parliament teem with complaints against manufacturers for sending out goods not required, because unsuitable for the purposes desired. For this the work people cannot be blamed. Again, it often happens that the newest and best machinery is sent abroad—to the Continent, to America, to the colonies, or elsewhere, which, when erected, competes with similar but older machinery at home. Probably some of the very best textile machinery in the world, made in England, is now at work in various parts of the world, through no fault of employers or workmen, but because each newest invention or improvement has been added, whereas those at work at home are a few years old. Mill owners cannot be expected to refurnish the mills often, but they suffer if they lag far behind, being outdone by their competitors at home or abroad.

That labor, or, in other words, the British workman, is not altogether blameless as regards the extent of foreign competition is generally admitted; to what extent is a matter of opinion. What is said is that, in cases where machinery is not opposed, the workmen try to limit the speed, or otherwise prevent machines from yielding the amount of work that they might reasonably give. If it is a question of danger, they have a right to a definite voice in their own defence. If, however, their object is to lessen production, their action is not so clear. At the time of the engineers' dispute the great complaint of the employers was that the men tried to limit the output in a way disastrous to the employer, and not beneficial to the men; as, illustrated by the demand for one man to one machine, when it was said that he could easily attend to two, or perhaps three, according to circumstances and the nature of the work. It is to be hoped that this question is now set at rest, or is at least relegated to conciliatory negotiation. A lib-

eral policy on both sides ought to bring about friendly mutual relations.

The limitation of output has always been a sore question, and trade unions have had to bear a large amount of vituperation on that account. Some of the old stories are exploded; they were not true. Still, it is well known that in some cases they have tried and do still try to regulate production, though it is doubtful whether any trade union rules exist in that sense.

A liberal interpretation of the well known demand for a fair day's wage for a fair day's work ought to settle the matter. It has a moral side as well as an economic side; it should mean a fair day's work for a fair day's wage. In reality, wages is a subsidiary matter, in a certain sense. The real question is, What is a fair day's work worth to the employer? Then it becomes a matter of calculation, together with cost of plant, of materials, interest on capital, and profit to the employer. It is the uncertainty of labor which is the difficulty. It is said that an employer can estimate to a nicety the cost of materials, of plant, and all other outlay, but cannot always be certain about the wages bill, especially if the undertaking is a large one, likely to last for some time. No doubt it is a difficulty, and it becomes greater if the output be lessened, and wages increased at the same time. The employer has to face advances in the prices of material also, but he is often able to protect himself by long contracts in case of fluctuations in prices. He is not able to do this in the case of labor, at least not under existing conditions, except where a sliding scale is available, as in the iron and steel trades. But sliding scales are not suitable in all cases.

As regards the engineering works visited on the Continent by Mr. Barnes, he thinks that the wages of the workmen and their hours of labor in the German workshops approximate more nearly to those in Britain than is generally supposed. He also states that the men go about their work more leisurely. The latter is scarcely true as regards American workshops. In the opinion of a couple of expert practical engineers who have just returned from a similar inspection, there is a greater disparity as regards hours, though not much. But they say that the organization is better; the machines turn out more; tools are employed which do the work quicker, and in some instances better than in similar establishments in this country. If, as Mr. Barnes states, the difference in wages is little, the hours only from one to one-and-a-half longer, and the men go more leisurely about their work—to which must be added better conditions as to comfort and meals—then the question is, How can the establishments compete with us? That they can and do compete is certain. In the interests of British trade, the workmen ought to know and realize the facts of the case, and face the question in the interests of labor. It is useless to pooh-pooh it; prudence demands action.

Trade unions have done great things for labor, and they may still do great things if they exercise their functions prudently and wisely, and avoid some of the blunders of the past. A policy of obstruction will not serve them; they must progress with the times. The British workman is no longer so far ahead of his foreign comrade as he was 30, or even 25 years ago. Machinery is bringing them up to par. The man, as a man, will still have his own special value as regards skill, dexterity, experience and strength; in the future the great factor in productiou will be the machine—its speed, its capacity of output, its fitness for the work intended to be done. In the production of that machinery, in its perfection by improvements, by the latest inventions and discoveries, we shall bear a part. But in its use and application to industry, the foreign competitor has an equal chance with manufacturers at home, as they can and will buy our machines if they are better, or construct machines of their own. This leveling-up process has been going on for years; it is still going on, and its progress will be much quickened in the future. The competition may be by the same machine, constructed on the same principles, made by the same makers, in each case up to date as regards the latest improvements. Then the output will depend upon the workers, in which case the British workman might have no fear, providing all other things are equal. But they might not be equal. Land and rents may be higher in England than in other competing countries, the cost of transit may be greater, the raw material may be dearer and less easily get-at-able. In such a case, the total cost of production may be greater, and our chances of competition be thereby lessened. The price of the commodity will determine the sale, for in these days price is almost everything, except in works of high art, where beauty is more highly prized than utility.

In this question of foreign competition the two parties chiefly and directly concerned are the employers and work people. These together constitute the producers, one by the supply of capital, workshops or mills, plant, etc., and the payment of wages during the period of production; the other giving their labor for hire, the skill and the strength requisite for the work. These, and these alone, can solve the problem. The two chief factors will be quality and price. Both depend upon the co-operation of each with the other. A struggle for supremacy—which shall be master—will be, must be, disastrous. The more closely capital and labor are associated for mutual advantage, the better. For labor to hamper capital is ruinous; for capital to starve labor is disastrous, even to capital, for labor in the concrete constitutes the mass of consumers. If work people cannot buy, production must fall to a minimum.

To be able to hold our own in the markets of the world, aye, even in our own markets, labor and capital must fraternize. The interests may not be quite identical, but they are so bound up together that injury to one means injury to both. Strife and struggle but play into the hands of competitors. The conflicts of capital and labor increase the difficulty of competition. Peace and prosperity go together. England has the capital, and by far the largest proportion of the transport service of the world. Our workmen can, if they like, compete with those of any other country, but they must not hold other workmen too cheaply, or they may awake to find themselves outdone. The more the workmen know about the conditions of employment and work in competing countries, the better. Their pride and their patriotism will be awakened, and they will not suffer themselves to be beaten if by energy and skill they can avert it.

[*Sanitary Plumber.*]

## Pointers on Practical Gasfittng.—No. I.

The first thing to be done when fitting up a house is to be sure that the plans are properly marked, and that every light desired by the owner is marked thereon. One will usually be well paid for the trouble if he calls upon the wife of the owner and looks over the plans with her, calling attention to each light and questioning whether or not it is located so as to give the best possible service. It should also be ascertained what kind of mantels are to be used. Those of extra height or having mirror cabinets should have the gas opening of their jambs placed on the side of the jamb and facing at right angles to the face of the mantel. It may be that the owner has some antique dresser or odd piece of furniture that would require special arrangement of the lights, such as an extra wide mirror or one of unusual height from the floor.

Ordinary bracket dresser lights should be about 4 feet 9 inches from the floor; hall brackets, 6 feet; mantel brackets, 5 feet; bathrooms, 6 feet; alcove lights, 4 feet 9 inches, and attic or short story lights placed as high as the ceiling will permit, not going above the schedule heights.

Care should be taken not to locate bracket lights where doors can be opened against them, as the least damage that can result from such errors is the breaking of a globe or bracket. Many fires have been started in this manner.

Newel post lights and those for dining-room sideboards, as well as kitchen lights, when the kitchen is only one story, are, as a rule, supplied by a branch from the riser in the basement.

On general principles it is better to use a 10 foot pole for centering rooms, even if you have to measure it off yourself. A tape-line often has a little off at the end, which you forget to allow for, or the figures are dirty. A gasfitter cannot keep a line clean, and for that reason he usually has a cheap one that will not bear washing, and which also stretches more or less. Stepping off measures with a pocket rule is bad practice, as there is not always a place to mark and one is apt to lose or gain on the actual distance. Measuring with the pole is more accurate and quicker work, and there is no chance for mistakes by holding the end at the wrong place—something which often occurs when a helper is depended upon to hold a line.

Locate the riser of a job as close to the service pipe as convenient. If the main is in the street, put the riser close to the front; if it is in the alley at the rear, put the pipe as far back as circumstances will permit. Never locate the riser in the outside wall of a frame house. Make the riser long enough to extend about 6 inches below the first floor joists.

A central location of the riser is often recommended by fitters on the ground that it saves big pipe. This is a mistake. The riser must be carried to the center, either downstairs or up, and in addition to that, big pipe must be run both ways, front and back, on the upper floor when the riser is centrally located. It does, however, sometimes save cutting joists equally and in undesirable places.

In centering parlors, or other rooms having sliding doors, remember

that one of the partitions between which the door will slide is likely to be of studding, and is seldom in place when the house is measured for gas pipe. For this reason, if the fitter is not careful, he will get the drop in one side of the room by centering without allowing for the partition not yet erected.

When locating pipes, partitions, or centers on the plans for any purpose which brings the relative position of other rooms, either above or below, into consideration, always measure from the outside face of the walls, as this is regular and free from jags or offsets generally.

When centering rooms in the building itself always take care to allow for offsets in the wall; the walls on one or more sides of a room may offset between the floor and the ceiling, thereby making the room in which you are measuring larger than the one which it is intended to have the pipe in the center of.

Remember, when allowing for a stairway or hall partition cutting off one side of room, that 1 foot variation in the location of the drop will compensate for 2 feet off the room, and that an offset of 4 inches in one wall only requires the drop to be 2 inches out of the true center of the room as measured above.

It is not always proper to put lights in the exact center of rooms, regardless of surroundings. Pay no attention to a joist throwing a drop an inch or so out of the way.

Chimney breasts or any minor extension of or projection into rooms should not be regarded when centering them. Put the light in the center of the space bounded by the principal walls. If slightly removing the drop from the center of a room will bring it in line with the drop in the center of another and more prominent room, it is sometimes a good idea to do so, especially if there are sliding doors between them. Having the fixtures even with each other makes a better appearance than otherwise when the doors are open.

In the case of dining room drops, the fitter will have to be guided by where the table will be placed. If the room is of ample size and there is nothing to prevent the table from being placed in the center, then locate the drop in the center of the room, or with reference to the position of the drop of one of the other rooms, as before suggested, if thought best.

All bracket openings for the second floor of a building in coal and water gas work are usually taken from the pipes which supply the drops and brackets of the first floor. This saves running large pipe up to the third floor and through the third floor joists, and it also takes a shorter piece of pipe to reach the proper height from the second floor than it would to come down from the third, especially when the ceilings are very high. Then, too, there are often two bracket openings over each other, so that one run of pipe over to the wall will answer for two lights, while if they were run separately it would take two pieces. The first floor lights are run down from the second floor instead of up from the cellar, because they are few in number, and the fitting from the pipe from the basement up to the different points would entail greater cost.

When there is no more pipe needed to do so, rout the pipe so that the branch pieces to the drops will travel some distance parallel to the joists. In this way there is a chance to spring the pipe back or forth a little if it does not come in just the proper place.

[To be Continued.]

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[From the *Metal Worker*.]

## Transition from Oval to Horizontal Round Pipe.

A correspondent in New York sends a drawing for a connection between a vertical oval and a horizontal round pipe, the round pipe being at one side of the oval. The connection is to be seamed together in three pieces. The two ends are straight throughout and the front straight up and down, as shown in his side view. The difficulty he finds is that he cannot lay out the pattern for the middle piece, as he does not understand how to construct the proper view from which to get the correct measuring lines, and therefore asks for assistance through the *Metal Worker*.

In our correspondent's original sketch, which is reproduced in Fig. 1, he has made an effort to give two correctly projected elevations of the pipes with their connecting or transition piece. A certain disparity, however, exists between the two views which must be disposed of before a solution can be given. The front view shows the vertical pipe cut off obliquely from left to right at *A B* to form a miter with the middle piece, while the side view shows the same pipe to be cut off obliquely from front to back at *C D*. As both conditions cannot exist at the same time it is safe to consider the front elevation as being correct and the oblique line *C D* as an error of projection. Our correspondent will note that, since points *A* and *B* of the front elevation are over the points *a* and *b* of the plan—that is, over the points representing the extreme ends of the major axis of the ellipse—the lines of projection from *A* and *B* should intersect with the line from point $a^1$ at the end of the major axis in the plan under the side view, and not with the two sides of the pipe at *C* and *D*, as shown. The elliptical plane represented by *A B* of the front elevation would then be correctly represented in the side view, as shown by *C D* of the side elevation in Fig. 2.

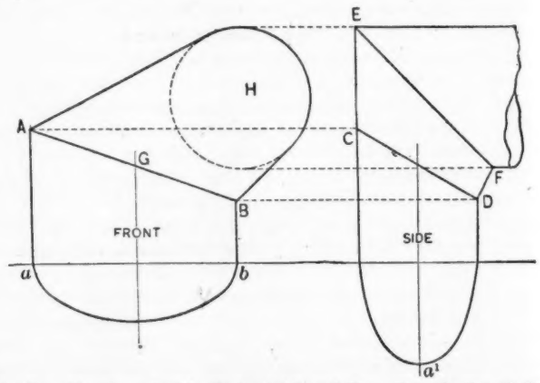


**Fig. 1.**—Transition from Oval to Horizontal Round Pipe. Reproduction of Correspondent's Sketch.

It may next be observed that, since the horizontal pipe is to one side of the vertical pipe and the transition piece forms the intermediate piece of the elbow, the opening in the oblique end of the horizontal pipe would not likely be made to turn straight down, as would seem to be indicated by the line *E F* of Fig. 1, but would be turned so that the throat of the miter between the horizontal and the intermediate pieces would be on a line from *G* to *H;* in other words, the two upper pieces of the elbow would lie in a plane represented by a line drawn through *G* and *H*. The horizontal pipe being thus turned upon its axis, as indicated by the arrow in the side view, Fig. 2, the points *E* and *F* of Fig. 1 would be shifted to the positions indicated by *E* and *F* of Fig. 2, which points are found by projection from points 7 and 1 of the profile *H* of the horizontal pipe in the front elevation, and the miter would correctly appear in the side elevation, as shown by the ellipse *E F* of Fig. 2. It would be quite as easy to cut the pattern for the transition piece of the oblique opening in the end if the horizontal pipe were allowed to remain in the position indicated in Fig. 1, but any mechanic will see at once the advisability of turning it as above described.

With the positions of the two ellipses forming the upper and the lower bases of the transition piece determined, it remains to obtain a view in which all points upon these two ellipses can be accurately located, so that the distances from points in the perimeter of one base to those in the perimeter of the other may be accurately measured and the surface of the transition piece thus developed. While two or three such views could be developed, it is perhaps best to accomplish this by means of a plan; and it may be here noted that since the transition piece cannot be divided in any manner so as to form symmetrical halves, the pattern cannot be developed from half plans, as shown in Fig. 1, but the full profiles of both the bases must be drawn in the plan used.

Therefore immediately below and in line with the vertical pipe in Fig. 2 draw the profile of the same, as shown by $A^1 K B^1 L$ and as obtained from *a b* of Fig. 1. The angle of the miter on the round pipe is presumed to be the same as though it were one piece of an ordinary 2-piece right angle elbow, as indicated by *E F* of Fig. 1. It will next be in order to add a view of this miter to the plan of the vertical pipe just drawn. To accomplish this it will first be necessary to place in position a plan of what would be the vertical arm of the square elbow were the above supposition true. Therefore from point *L* of the plan, Fig. 2, draw a horizontal line indefinitely in either direction, as shown. To the right and at any convenient place draw the profile *M*, equal in diameter to *H*, of Fig. 1, so that it shall be tangent at its front side with the line just drawn from *L*, or, in other words, place it flush with the profile of the elliptical pipe, and bisect it by a vertical line, 1 7, drawn through its center, as shown. As the throat of the suppositional arm represented by this plan would necessarily be on the side furthest from the front, no matter in which way it may be swung by the rotation of its horizontal arm, begin at this point (1) and divide profile *M* into any

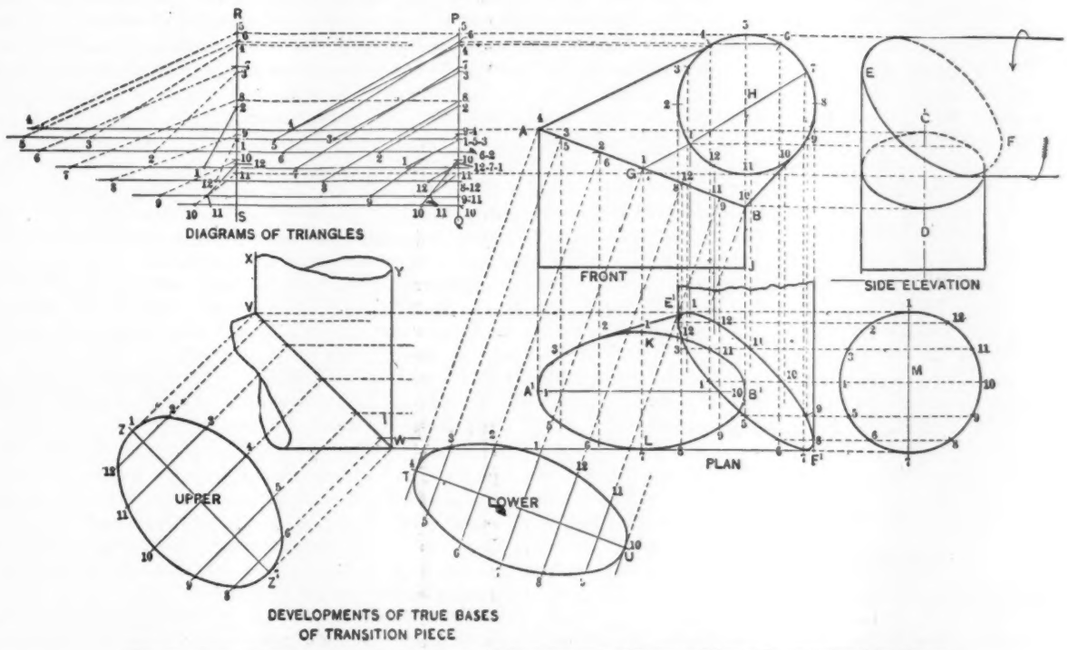


**Fig. 2.**—Correctly Drawn Elevations and Plans with Developments of Upper and Lower Bases of Transition Pieces.

convenient number of equal spaces, as shown by the smal figures. Since the throat upon the horizontal arm of this miter has been previously located upon the line *G H* of the front elevation, begin at the intersection of this line with the profile *H*, point 1, and divide profile *H* into the same number of equal spaces as the profile *M*, as shown by the small figures, and from the points so obtained drop vertical lines indefinitely across the plan and intersect them with lines drawn horizontally from points of corresponding number on profile *M*. A line traced through the points of intersection, as shown between *E* and *F*, will give a correct plan view of the miter line between the two upper pieces of the elbow.

Having now obtained the plan of the upper miter or base with its points of division, next divide the plan of the lower base of the transition piece *A*¹ *K B*¹ *L* into the same number of spaces, as shown by the small figures, numbering the points so that lines joining points of similar number on the two bases will be as nearly parallel with the form of the transition piece as possible, all as shown on the plan in Fig. 3, which is in every respect a duplicate of that portion of the plan in Fig. 2 bearing the same letters. After drawing the solid lines con-

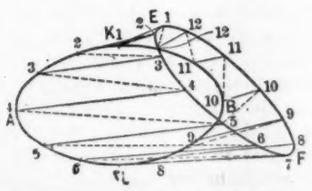

**Fig. 3.**—Plan of Transition Piece, Showing Method of Triangulation.

necting points of similar number in Fig. 3, above referred to, also draw dotted lines connecting points of the lower base with those of the next higher number in the upper base, as shown. These several solid and dotted lines will form the bases of a series of right angled triangles whose hypothenuses will give the correct distances across the pattern. The altitudes of these triangles are equal to the vertical height between desired points, as given on the front elevation.

These triangles may be constructed most conveniently as follows: At any convenient position on either side of the elevation, Fig. 2, draw the perpendiculars *P Q* and *R S*. From the several points on the profile *H* carry lines horizontally, cutting *P Q* and *R S*, and from the several points on *A B*, the lower base of the transition piece, carry lines horizontally cutting the perpendiculars, continuing them indefinitely, as shown, to the left. Upon each of the horizontal lines just drawn, measuring from *P Q*, set off the length of the solid line of corresponding number, as given in Fig. 3. Thus upon lines 1, 2, 3, etc., make the distances of points 1, 2, 3, etc., from the line *P Q* equal to the length of lines 1 1, 2 2, 3 3, etc., of the plan, Fig. 3, and, finally, draw solid lines connecting points obtained on the horizontal lines with those of similar number on the perpendicular. Then will these several hypothenuses, 1 1, 2 2, 3 3, etc., be the correct distances between points of similar number as measured on the finished article. The hypothenuses of the diagram of dotted triangles are found in a similar manner, first making the lengths of the horizontal lines equal to those of the dotted lines in Fig. 3, and, finally, by connecting the points obtained on the horizontal lines with those of the next higher number upon *R S*, as shown dotted.

One more operation is necessary before the pattern can be developed viz., that of obtaining the true perimeters of the two bases of the transition piece. To obtain the true lower base, first carry lines vertically from each of the points in the plan of the elliptical pipe *A*¹*K B*¹ *L* of Fig. 2, cutting the line *A B* of the elevation, and from the points thus obtained carry lines at right angles to *A B* indefinitely and intersect them at any convenient position by *T U*, drawn at right angles to

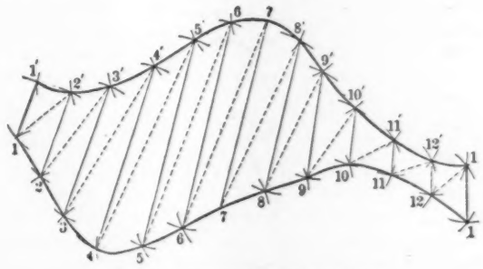

**Fig. 4.**—Pattern of Transition Piece.

them. Upon each of the lines cutting *T U*, and measuring from *T U*, set off the distances of corresponding points in *A*¹ *K B*¹ *L* as measured from *A*¹ *B*¹. A line traced through the points thus obtained will give the required true perimeter of the lower base. To obtain the true perimeter of the upper base it is necessary to first draw what is really a view of the upper miter as viewed in a line at right angles to *G H* of the elevation in Fig. 2, which is shown at the extreme left of the plan. The distance between the two lines *V X* and *W Y* is equal to 1 7, the diameter of the profile *H*, and point *W* is placed flush with the front of the plan, as shown, since it corresponds with point *E* upon either of the side views.

From *W* draw the line *W V* at 45 degrees, as the miter line of an ordinary square miter. Now from points in profile *M* carry lines horizontally, cutting *V W*, and from points so obtained carry lines indefinitely at right angles to *V W*, and at any convenient position intersect them with any line, as *Z Z*, drawn at right angles to them. The distances of the points from *Z Z* on the several lines are equal to the distances of points of corresponding number of profile *M* from the line 1 7. Care must be taken in the developments of the bases to see that the

points in each are numbered to correspond with those of the plans from which they are derived.

The pattern may now be developed in the usual manner. First draw any line, as $1^1$ 1 of Fig. 4, which make equal to the hypothenuse 1 1 of the diagram of solid triangles in Fig. 2. With $1^1$ as a center and with a radius equal to 1 2 of the true upper base describe a small arc, which intersect with another small arc struck from 1 of the pattern as center with a radius equal to the hypothenuse 1 2 of the diagram of dotted triangles, thus locating point $2^1$ of the pattern. From 1 of Fig. 4 as center and 1 2 of the true lower base as a radius describe a small arc, which cut with another arc struck from $2^1$ of the pattern as center with a radius equal to the hypothenuse 2 2 of the diagram of solid triangles. So continue using the dotted hypothenuses with the spaces on the true upper base to form the upper line of the pattern and the solid hypothenuses with the spaces on the true lower base to form the lower line of the pattern, all as indicated in Fig. 4.

The pattern for the miter on the horizontal arm of the elbow is the same as that for any two-piece right angle elbow of the given diameter, and may be developed from the profile *M* and the miter line *V W* of Fig. 2; and the miter on the vertical arm of the elbow may be developed in the usual manner from the profile $A^1 K B^1 L$ and the miter line *A B*. These operations may be conducted entirely separate from the other part of the problem and are so simple as to need no further explanation.

## Reinforcing a Well by Galleries.

*Engineering Record* notes that one of common methods of increasing the yield of wells abroad is to run galleries from them so as to intercept a larger proportion of the ground water. For one reason or another, this plan is not often followed in this country. It is accordingly interesting to notice an instance of such work, which was described in a paper presented before the Illinois Society of Engineers and Surveyors by Prof. W. D. Pence. and recently printed in the Proceedings of that organization.

A well was dug at an important division point of a railroad in the dry region of the Southwest for the purpose of supplementing the supply purchased from the city water-works, which was not sufficient for all requirements. The well was 20 feet in diameter and the depth to bed rock about 25 feet, consisting of 2 feet of top soil and a whitish clay for the remainder of the depth. A shallow basin was blasted out of the bed rock for storing the supply, and a dry wall of "one-man" stone was built up to within 3 or 4 feet of the surface of the ground, the remainder being laid in Louisville cement and plastered. The well was excavated with scrapers, much the same as a celler, by leaving inclines on either side. In back-filling the earth a depressed place was left for use as a pump pit, and the suction pipe was run through the wall and thence down into the sump or basin already mentioned. After the well became an assured success, a substantial wooden pump house was constructed over the boiler and pump pit, and the plant was fitted up neatly.

When first tested the well was found to supply only about half the required amount. After some discussion, it was decided to construct an experimental tunnel or gallery along the bed rock. A hole about 4 feet high and 18 inches wide was made through the dry wall on the side where the largest inflow was observed, and a tunnel of about that cross section was drifted along the bed rock. The clay was considerably more firm and stiff for some distance above the bed rock than near the surface of the ground; and this fact, while doubtless decreasing the inflow, proved very advantageous in forming stable walls for the gallery. It was found unnecessary to brace the sides of the gallery, but the roof was supported by 2 by 12-inch planks and 4 by 4-inch struts, the latter placed in pairs recessed into the sides of the drift and placed between horizontal pieces of 2 by 4-inch, so as to leave the way clear for the laborers to work. A small trench was constructed along the bottom of the tunnel with picks, the surface of the bed rock being soft enough to permit the use of this method, and a slight grade toward the well was provided to facilitate the flow of the water to the sump.

The drift had gone but 40 feet when a sudden rise in the bed rock was encountered, causing a suspension of the work. The well was tested again and showed a gratifying increase. It was at once decided to start a new tunnel on the opposite side of the well, and with the experience gained in the first one more rapid progress was made. Here again a rise in the rock was found, although it was less abrupt than the first and the distance was about 110 feet. It was found, also, that the bed rock sloped slightly away from the well, and this tunnel, while nearly three times as long as the first one, did not seem to deliver any more water. As there was still lack of water, a third gallery was started on the more promising side of the well a quarter way round from the other two. This one was the most prolific of all in its yield, and the influx had become such that the pump had to be kept going at a moderate rate most of the time to make it possible for the men to keep at work. This tunnel also ran into the break in the top surface of the bed rock in about 140 feet. The flow was so satisfactory, however, that it was decided to run a branch gallery approximately parallel to the break in the rock, which was now roughly located.

It was found necessary to sink a shaft at the junction of the two tunnels owing to the distance to the well whence all the clay had been carried hitherto and hoisted by means of a windlass and bucket. A bit of underground surveying was necessary in order to locate the spot for the shaft 100 feet from the well. This branch tunnel was made 40 feet long, when the break in the rock surface was again found, thus locating four points, presumably on the same line of deformation. While it was not conclusively proved, everything indicated that the well happened to be located in a natural depression or basin in the bed rock; and it was purely a matter of chance, for a town lot which the railroad had not been able to dispose of was utilized for the well site. A curious, and, at least for the railroad, very gratifying result of this phenomenon was the failure of the effort of an enterprising citizen to drain the railroad well by constructing a still deeper well on the adjacent lot, where he very naturally supposed the bed rock would be lower, and thus, perhaps, a legal contest on riparian rights as regards subterranean waters was obviated.

While this experiment is by no means a new one, its marked success at a very dry time in a very droughty country suggests that its use may frequently be justified in small water works systems, depending on surface wells for their supplies. The difficulties of construction in the case here described were perhaps the least that may be excepted in any case, and where quicksand pockets are likely to be found, the method becomes very expensive and dangerous to apply.

It was believed, previous to undertaking the gallery method of developing this railroad well, that so far as the water collecting feature was concerned, each foot of gallery would be equivalent to say 2 linear feet of the ordinary periphery of the well. On this assumption, the 330 feet or so of gallery would equal 660 feet of well circumference along the water bearing stratum next to the bed rock, equivalent to a diameter of more than 200 feet, or say ten times the actual diameter of the original well in this case. Doubtless this assumption was quite a good deal in excess of the true equivalent, owing in part to the friction of the tortuous channel along which the water trickled and in part to the fact that the entire length of the tunnel was not effective in its contact with the water-bearing stratum.

## ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Dr. John H. van Deursen, a Director in the Gas Light Company of the City of New Brunswick, N. J., died in New Brunswick, the afternoon of the 3d inst. Deceased, who was in his 50th year, had been prominent in educational affairs in Middlesex county, New Jersey, since 1888. His actual business was that of a pharmacist.

Adair, Iowa, wants a gas works, but is inclined to make the try with a plant of the acetylene variety.

We are told that Messrs. Christian W. Lynch and Wm. Jennings, respectively President and Treasurer of the Hagerstown (Md.) Street Railway Company, and Mr. Edward W. Mealey have purchased the plant and properties of the Hagerstown Gas Light Company. If we mistake not, the folks named have heretofore been prominent in Hagerstown electric lighting circles.

A newspaper clipping from Toledo, Ohio, says: "It is now claimed that the City Gas Company, formed for the purpose of supplying artificial gas to the Toledo city natural gas plant will be absolutely ready for service by the first week in November. Arrangements have been made by which the building used by Mr. T. P. Brown, in his experiments with gas from oil last year, when he attempted to supplement the city's natural gas supply, has been secured, and, with a small addition that can be speedily erected, will it is believed answer all purposes."

The correspondent who forwarded the above adds: "This refers really to our own Charles D. Hauk, of Springer process fame. How are the mighty fallen! T. P. Brown ran this plant last winter, with 5 gallons of 72° naphtha per 1,000 cubic feet, that cost him 7 cents per

gallon in tank car. He sold the gas to the city at 15 cents per 1,000 cubic feet, but worked up no more than a single tank. His excuse for stopping, as published in the newspapers, was that naphtha 'was so scarce he could not buy it.' Well, we will see what 'our Charlie' will do with it."

MR. GEORGE W. GRAVES, of Rochester, N. Y., in conjunction with Mr. O. P. Moon, of Lorraine, O., has been granted a patent regarding certain features in the construction of direct-action gas ranges.

THE Directors of the Portland (Me.) Gas Light Company have elected Mr. Burton Smart to the Treasurership, vice Mr. F. E. Moore, resigned.

THE Ottumwa (Ia.) Gas, Light, Heat and Power Company has filed a mortgage on its properties amounting to $100,000. The trustee of the indebtedness is the Equitable Trust Company, of Chicago.

UP Beverly way, Massachusetts, the residents term the Welsbach street lamps for outdoor lighting as "The new enclosed arcs;" so the Beverly *Times* of recent date declared, in a "funny article" evidently written by a reporter whose "ride in a buggy" was not being paid for by himself.

MR. THOMAS H. MALONE, President of the Nashville (Tenn.) Gas Light Company, notifies the shareholders that a special meeting of the Company will be held in Nashville the 25th inst., for the purpose of considering "what steps should be taken for the reorganization of the Company, in view of the approaching expiration of its charter; and especially to pass upon a proposition for the lease or purchase of its assets and franchises, which will be submitted to them, and to further consider any other matters relating to the interests of the Company that may be brought before them." This looks like the beginning of the end of the old Nashville Company.

AN exchange says that the theft of gas under circumstances which are interesting from the audacity displayed by the defendants was brought to light recently in the police court of Ipswich, England. The charge was the theft of 3,000 cubic feet of gas valued at $2 50. The gas service had evidently been tapped at the joint on the street side of the meter and a rubber hose connection used, so as to admit of ready removal to avoid discovery. It got to be the custom, however, that this transaction was left to the last moment, so that every time the inspector would call he would be asked to go next door first. The occasional odor of escaped gas aroused suspicions, and on one occasion the unions to the meter were found loose. Finally, when he called, and as before was asked to wait a few minutes, he followed the defendant's wife and found in her hands a rubber tube. Both defendant and his wife denied having in any way interfered with the meter, but the Mayor was convinced that the charge was proved. He imposed a fine of $9.75 and costs (the latter amounted to about $7), in default of which the thief was to remain imprisoned for a month. The fine was paid.

WE are more than pleased to report the return, to duty and work, of Mr. Leonard E. Walker, Secretary of the Lansing (Mich.) Gas Light Company, who was removed to his home at Newark, O., some weeks ago, suffering from a severe attack of typhoid fever.

THE Jersey City (N. J.) *Journal*, dated the 7th inst., said: "All the Gas Companies of Hudson County were combined to-day and amalgamated into a new corporation, to be known as the Hudson County Gas Company, of which Mr. Robert W. Elliot will be the General Agent and Manager, with offices as heretofore in the United Gas Improvement Company's building on Montgomery street, near Warren street. The Companies that have joined the combination are: The Peoples Gas Light Company, the Jersey City Gas Light Company and the Consumers Gas Light Company, and the Hudson County Gas Light Company, of Hoboken, and the Bayonne and Greenville Gas Light Company, of Bayonne, N. J. It is further understood that the Hudson County Gas Company is to be capitalized in the sum of $10,500,000."

W. T. FAULKNER, who has been for months trying to secure a franchise for the operation of an opposition gas plant in Topeka, Kansas, has at last induced the Council to seriously consider his proposition—he also wishes to operate an electric lighting plant. Generally speaking, he agrees to perform the lighting service on the following terms: Gas for use in the public buildings, 75 cents per 1,000 cubic feet; for ordinary consumers, on cooking or illuminating account, during the first two years, $1 per 1,000; next three years, 95 cents per 1,000; for the remainder of the life of the franchise—25 years—90 cents per 1,000. Gas for use for heating or power purposes is to be sold at 50 cents per 1,000. The electric schedule is: For each 16-candle incandescent lamp, nine-tenths cent per hour; for each 32-candle incandescent, 1¼ cents per hour; the minimum rate, however, as shown by the use, to be charged at not less than $1.25 per lamp per month. For arc lighting, the midnight service is to cost $7.50 per lamp per month; the charge for an all-night service to be $10 per lamp per month. Mr. Faulkner agrees to have the plant in operation within *three* years, and to expend $100,000 in two years. So much for Mr. Faulkner's promises; and as an appendix to his promises we submit the following statement respecting his accuracy of speech.

WHEN asked by a reporter of the Topeka *Capital* as to how many gas plants he now had in operation, Mr. Faulkner replied, "At present but one, that being in Chicago." Now, the question with us is, "Where is Mr. Faulkner's gas plant in Chicago located?" Looked all over the Faulkner proposition in Topeka has a wonderful lack of sincerity about it.

A CORRESPONDENT says that the River Shore Gas Company, which has been formed to supply gas to the residents of Riverton, N. J., has agreed to furnish gas free on municipal account, and to pay into the borough treasury 1 per cent. of its gross receipts for a term of 5 years. All of which looks rather an onerous bargain.

A RATHER belated item refers so the annual meeting of the Worcester (Mass.) Gas Company. No change was made in the official management, nor was any change ordered in the selling rate, which had been readjusted some months ago. It is thought, however, that next fall a further concession to the consumers will be ordered.

A CORRESPONDENT in San Francisco, Cal., writes: "Last month there was some dissatisfaction with the electric lights in Bakersfield. Between 9 and 10 P. M. one evening the street lights were extinguished, the interruption of the service lasting only a few seconds. Subsequent investigation 'proved' that a large, blue crane had been entangled in the wires at a point where the insulation was imperfect. The bird was found lying quite dead at the foot of a pole, located on Railroad avenue near the mill. This is said to be a true bill."

THE proprietors of the Plainfield (N. J.) Gas and Electric Light Company have announced reductions in the selling rates, the concessions to date from November 1st. Under the new schedule the gross rate for gas on illuminating account is to be $1.50 per 1,000, with 10 cents off per 1,000 for prompt payment, the discount for fuel uses to be 25 cents per 1,000.

THE proprietors of the Hamilton (Ont.) Gas Company have notified the residents that on and after November 1st the selling rate shall be, on all accounts and uses, $1.50 per 1,000 gross, with 50 cents per 1,000 off for prompt payment—within 14 days. No meter rentals will hereafter be charged.

THE Milwaukee (Wis.) *Sentinel* says that the proprietors of the Milwaukee Gas Light Company have decided to go on with the erection of the large gasholder which it was proposed to construct some time ago. The increasing output of the Company will no longer stand for inadequate storage capacity.

THE project for the establishment of a gas works at Shelby, O., is in a forward stage. The promoters have received sufficient assurances from the residents that their demands for gas will be heavy enough to put the enterprise on a paying basis right from the start. The work of construction, however, will not be undertaken before next spring.

THE Elmira and Seneca Lake (N. Y.) Railway Company is vigorously pushing the construction of its line. The American Engineering Company, of Philadelphia, which is the general contractor for the road, has placed its order for the 17 bridges required with the Berlin Iron Bridge Company, of East Berlin, Conn.

THE authorities of Monroe, Mich., seem inclined to purchase the plants of the Monroe Gas and Electric Light Company for operation on municipal account; but it is thought that the taxpayers will defeat the scheme, which had progressed to the point of the passage of a resolution through the City Council to bond the city in a sum sufficient to pay the price asked for the plants by the owners thereof.

A CORRESPONDENT in Rochester, N. Y., says that the Board of Trustees of the village of Dansville, N. Y., have granted a new franchise

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THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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CHAS. E. SANDERSON,
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AGENTS:

New York—American News Co., 39 and 41 Chambers St.
*Germany*—Lemcke & Buechner, of New York.
*England*—Aug. Siegle, 30 Lime Street, London.

MONDAY, OCT. 16, 1899.

(*Continued from page* 617.)

to the owners of the Dansville Gas and Electric Light Company, which agreement is to run for 30 years.

MR. C. C. HOWELL has been appointed Manager of the Tennessee Gas and Coke Company, which concern was originally formed for the purpose of constructing an opposition gas plant in Knoxville, Tenn. Its promoters say they will have a works in active operation in Knoxville by next August. Meanwhile the old Knoxville Company is pegging right along.

THE authorities of Richmond, Va., through their miserable pettifogging of months ago over making an appropriation for extensions to the municipal gas plant, are now confronted with the pleasant fact the plant will be 30 per cent. or more behind the demands that will be made upon it this winter. All of which is rather rough on Superintendent Knowles.

A. B. T. forwards the following clipping, from Duluth, Minn., under date of the 6th inst.: "Mr. L. N. Case, Manager of the Water and Light Department of Duluth, has issued a circular in reference to the gas division, which he is sending out with all bills this month, and which is also being distributed to the people of the city. It calls attention to the success which the gas plant is achieving, and finally ends up by saying that, although the record so far is that municipal gas plants are failures, Duluth is bound to prove an exception to the rule. The circular declares: "In July we had a net gain of 17 meters and sold 23 per cent. more gas than we sold in the corresponding month of 1898. In August we had a net gain of 28 meters and sold 52 per cent. more gas than we sold in the corresponding month of 1898. In September we had a net gain of 50 meters, quantity of gas sold not yet known. This makes a total net gain for the three months of 95 meters, and, estimating for September by taking 87 per cent. of gas delivered as gas sold, the same as August, we sold 1,875,000 feet more than the corresponding months of last year, or a gain of over 45 per cent. Instead of having 200 or 300 gas meters on the shelf, as customary heretofore, we have had to order 46 more. This success is due to the people, who are awakening to a realizing sense that the water and gas plants belong to them. The Board and its management may be ever so good and honest and economical, yet without the people use the gas, the business will be a failure.' In regard to the expense of conducting the plant, Mr. Case says: 'Let me give you some information regarding the expense of operating a gas plant. I will divide this expense into three parts:

"Part I. Will include the cost of coal, oil, purifying materials and all other expenses that enter into the manufacture of gas, other than labor.

"Part II. The labor of making gas, the repairing of mains and meters, the reading of meters and all the expenses of office, shop and the clerical work pertaining thereto.

"Part III. The interest on the plant. The expenses, based upon the first 11 months' experience, were, in round numbers, as follows: Part I., $10,000; Part II., $10,000; Part III., $16,000. There was sold on an average 60,000 cubic feet of gas per day. In order to pay expenses as above, we should receive $1.22 for each 1,000 cubic feet of gas sold, of which Part I. would cost 34 cents; Part II. would cost 34 cents; Part III. would cost 54 cents. Now, supposing we double our output to an average of 120,000 feet per day. Part I. would be doubled, or for 2,000 feet 68 cents; Part II. possibly increased 10 per cent., 38 cents; Part III. remain the same, 54 cents; a total cost for 2,000 feet of $1.60, or for 1,000 feet, 80 cents. We are rapidly approaching this average. Since Nov. 1 the Department has sold 1,000 Welsbach lamps, and it will send a man to any consumer to examine fixtures, lamps and tips, and will substitute new tips for the old. All of these get out of order and the consumer is apt to think the gas is bad.'"

## The Market for Gas Securities.

Steadiness and strength were the characteristics of the city gas share market last week, which may be considered a most favorable state, remembering the peculiar (even if forced) money conditions that exist. All indications on the surface point the fact that the rate war is at an end; and it is undeniable that the consumer cannot now get a gas stove unless he pays the price. Mr. Brady and his friends are still in the ring, but they seem to be willing to admit that a referee might help them. Our advice is, even though it is keyed to the same old score, to buy any sort of city gas shares, which remark applies particularly to Standards. One soft spot in the market is shown in the quotations for New Amsterdam bonds.

Brooklyn Union is 138 bid; Peoples, of Chicago, is a shade under 110; and Bay State is soft, at under 2. The movement of the week was shown in Laclede common, which sold well beyond 70, but receded a trifle to-day, Friday.

## Gas Stocks.

**Quotations by George W. Close, Broker and Dealer in Gas Stocks.**

16 WALL STREET, NEW YORK CITY.

OCT. 16.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

| *N. Y. City Companies.* | *Capital.* | *Par.* | *Bid.* | *Asked.* |
|---|---|---|---|---|
| Consolidated | $39,078,000 | 100 | 188¼ | 189 |
| Central Union, Bonds, 5's. | 3,000,000 | 1,000 | 107½ | 108½ |
| Equitable Bonds, 6's | 1,000,000 | 1,000 | 106 | .. |
| " 1st Con. 5's | 2,300,000 | 1,000 | 115 | 118 |
| Metropolitan Bonds | 658,000 | .. | 108 | 112 |
| Mutual | 3,500,000 | 100 | 273 | 300 |
| " Bonds | 1,500,000 | 1,000 | 100 | 102 |
| Municipal Bonds | 750,000 | .. | .. | .. |
| New Amsterdam Gas Co. | 13,000,000 | 100 | 29¾ | 29⅞ |
| Preferred | 10,000,000 | 100 | 54 | 54½ |
| Bonds, 5's | 11,000,000 | 1,000 | 94 | 96 |
| Northern Union, Bonds, 5's. | 1,250,000 | 1,000 | 95 | 97 |
| New York and East River.. | | | | |
| Bonds 1st 5's | 3,500,000 | 1,000 | 109 | 111 |
| " 1st Con. 5's | 1,500,000 | | 112 | 114 |
| Richmond Co., S. I. | 348,650 | 50 | 70 | .. |
| " Bonds | 100,000 | 1,000 | .. | .. |
| Standard | 5,000,000 | 100 | 110 | 120 |
| Preferred | 5,000,000 | 100 | 130 | 140 |
| Bonds, 1st Mortgage, 5's | 1,500,000 | 1,000 | 112 | 114 |
| Yonkers | 299,65 | 500 | 130 | .. |
| *Out-of-Town Companies.* | | | | |
| Brooklyn Union | 15,000,000 | 100 | 138 | 142 |
| " " Bonds (5's) | 15 000,000 | 1,000 | 118 | 119 |
| Bay State | 50,000,000 | 50 | 1⅝ | 1¾ |
| " Income Bonds | 2,000,000 | 1,000 | .. | 75 |
| Binghamton Gas Works.. | 450,000 | 100 | 40 | .. |
| " 1st Mtg. 5's | 450,000 | 1,000 | 95 | 98 |
| Boston United Gas Co.— | | | | |
| 1s Series S. F. Trust | 7,000,000 | 1,000 | 92 | .. |
| 2d " " " | 3,000,000 | 1,000 | 68 | 71 |
| Buffalo City Gas Co. | 5,500,000 | 100 | 8 | 9½ |
| " " Bonds, 5's | 5,250,000 | 1,000 | 84 | 85 |
| Central, San Francisco | 2,000,000 | .. | 105 | .. |
| Chicago Gas Co. Guaranteed Gold Bonds | 7,650,000 | 1,000 | 104 | 104¼ |
| Columbus | 1,144,700 | 100 | 70 | 75 |
| 1st Mortgage | 1,207,000 | 1,000 | 106 | 108 |
| Consumers. Jersey City | 2,000,000 | 100 | 100 | .. |
| " Bonds | 600,000 | 1,000 | 107½ | 110 |
| Cincinnati G. & C. Co. | 8,500,000 | 100 | 193¾ | 194 |
| Consumers, Toronto | 1,700,000 | 50 | 230 | 235 |
| Capital, Sacramento | 500,000 | 50 | .. | 35 |
| Bonds (6's) | 150,000 | 1,000 | .. | .. |
| Consolidated, Baltimore | 11,000,000 | 100 | 61 | 62 |
| Mortgage, 6's | 3,600,000 | .. | .. | 118 |
| Chesapeake, 1st 6's | 1,000,000 | .. | .. | .. |
| Equitable, 1st 6's | 910,000 | .. | .. | .. |
| Consolidated, 1st 5's | 1,490 000 | .. | .. | 112 |
| Consolidated Gas Co. of N.J. | 1,000,000 | 100 | 21 | 23 |
| " Con. Mtg. 5's | 380,000 | 1,000 | 87 | 90 |
| Consolidated G. & E. Co.'s., Little Falls, N.Y. | 90,000 | 100 | .. | 100 |
| Bonds | 75,000 | .. | .. | 100 |
| Detroit City Gas Co | 4,560,000 | 50 | 99 | 99½ |
| " Prior Lien 5's | 4,546,000 | 1,000 | 94¾ | 94½ |
| Detroit Gas Co., 5's | 423,000 | 1,000 | 99 | 99½ |
| " Inc. 5's | 31,000 | 100 | .. | .. |
| Equitable Gas & Fuel Co., Chicago, Bonds | 2,000,000 | 1,000 | .. | 101 |
| Fort Wayne | 2,000,000 | .. | 77 | 83 |
| " Bonds | 2,000,000 | .. | 80 | 85 |
| Grand Rapids Gas Lt. Co. | 1,000,000 | 50 | .. | .. |
| " 1st Mtg. 5's | 1,125,000 | 1,000 | .. | .. |
| Hartford | 750,000 | 25 | .. | 220 |
| Indianapolis | 2,000,000 | .. | 122 | 128 |
| " Bonds, 6's | 2 650,000 | .. | 105 | 106 |
| Jackson Gas Co | 250,000 | 50 | 50 | .. |
| " 1st Mtg. 5's | 250,000 | 1,000 | 96 | 100 |
| Jersey City | 750,000 | 20 | 225 | 275 |
| Lafayette Gas Co., Ind. | 1,000,000 | 100 | 68 | 70 |
| Bonds | 1,000,000 | 1,000 | 81 | 86 |
| Louisville | 2,570,000 | 50 | 106 | 108 |
| Laclede, St. Louis | 7,500,000 | 100 | 69½ | 70 |
| Preferred | 2,500,000 | 100 | 96 | 100 |
| Bonds | 10,000,000 | 1,000 | 107 | 108 |
| Madison Gas & Elec. Co. | 400,000 | 100 | 82 | 85 |
| " 1st Mtg. 6's | 350,000 | 1,000 | 102 | .. |
| Montreal, Canada | 2,000,000 | 100 | 200 | .. |
| Newark, N. J., Gas Co | 16,000,000 | .. | 50 | 60 |
| Bonds, 6's | 4,600,000 | .. | 107 | 108 |
| New Haven | 1,000,000 | 25 | 280 | 300 |
| Nashville Gas Lt. Co. | 1,000,000 | 50 | 110 | .. |
| Oakland, Cal. | 2,000,000 | .. | 53½ | 55 |
| " Bonds | 750,000 | .. | .. | .. |

| | | | | |
|---|---|---|---|---|
| Peoples G. L. & Coke Co., of Chicago | 25,000,000 | 100 | 109¾ | 109⅞ |
| Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage | 20,100,000 | 1,000 | 111½ | 112 |
| 2d " | 2,500.000 | 1,000 | 104 | 105 |
| Peoples, Jersey City | 500,000 | 50 | 215 | .. |
| Rochester Gas & Elec. Co.. | 2,150,000 | 50 | 88 | .. |
| Preferred | 2,150,000 | 50 | 118 | .. |
| Consolidated 5's | 2,000,000 | .. | 87¾ | 90 |
| San Francisco, Cal. | 10.000,000 | 100 | 70 | 73 |
| St. Paul Gas Light Co. | 1,500,000 | 100 | 30 | 32 |
| 1st Mortgage 6's | 650,000 | 1,000 | 82 | 85 |
| Extension, 6's | 600,000 | 1,000 | .. | .. |
| General Mortgage, 5's | 2,428,000 | 1,000 | 80 | 82 |
| St. Joseph Gas Co. | 1,000,000 | 100 | 42 | 44 |
| " 1st Mtg. 5's | 750,000 | 1,000 | 96 | 99 |
| Syracuse, N. Y. | 1,750.000 | 100 | 12 | 15 |
| Bonds | 1,612 000 | 1,000 | 81 | 84 |
| Washington, D. C | 2,000,000 | 20 | 280 | .. |
| First mortgage 6's | 600,000 | . | . | .. |
| Western, Milwaukee | 4,000,000 | 100 | 99 | 100 |
| Bonds, 5's | 3,880.500 | . | 106 | 108 |
| Wilmington, Del. | 600,000 | | 220 | 250 |

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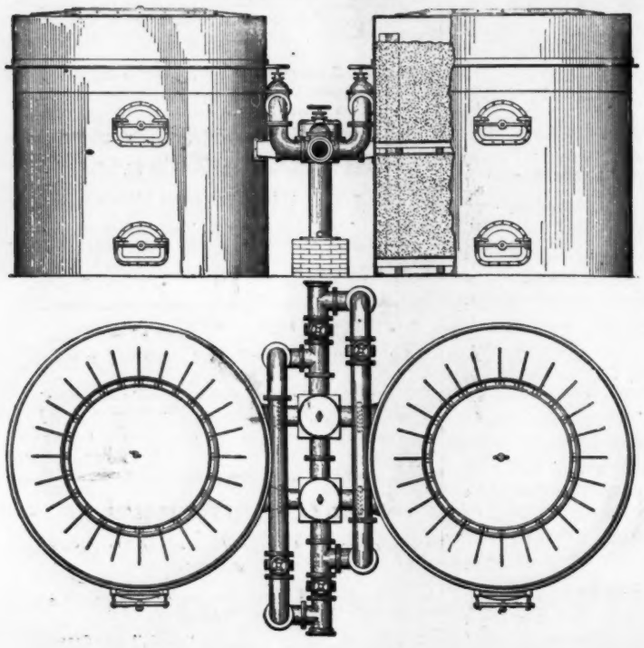

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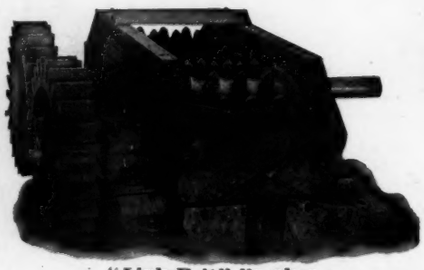

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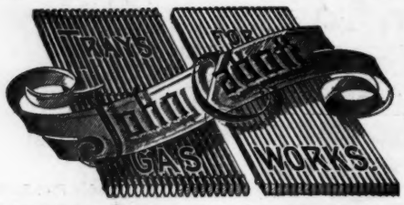


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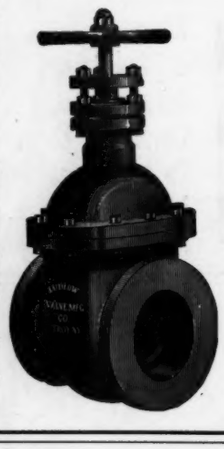

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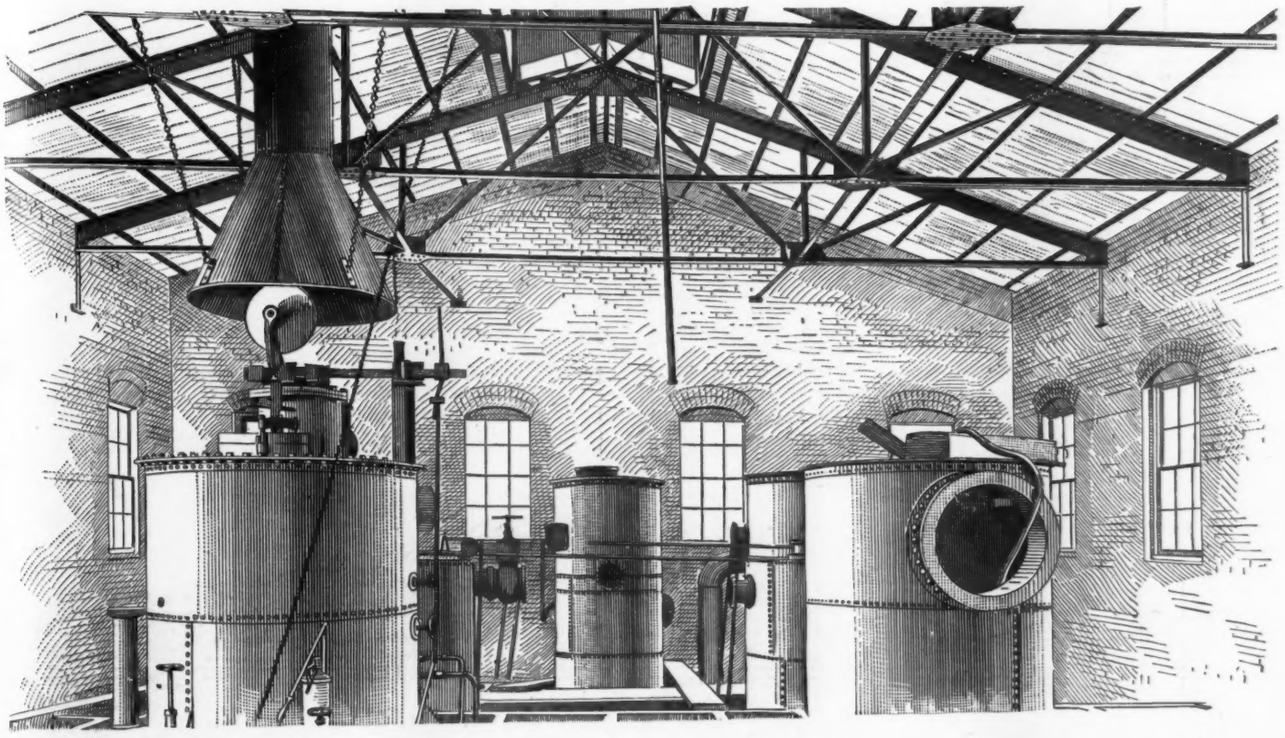

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Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas

**GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.**

COMPLETE GAS WORKS

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**Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa**

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## LATEST IMPROVED GAS EXHAUSTER

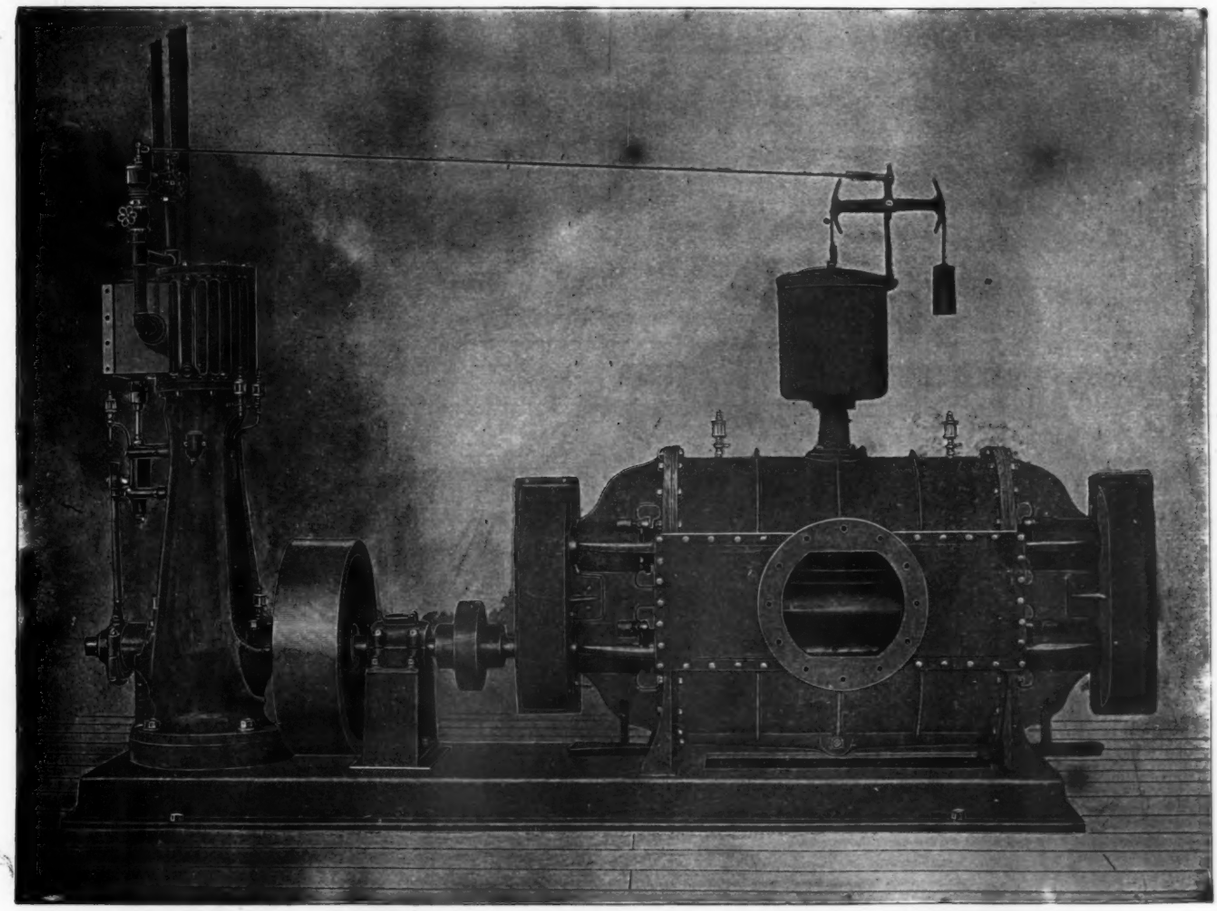
—AND—

## NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

## The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



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## P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

## American Gas Company,

222 South Third Street, Philadelphia, Pa.

New York, 33 Nassau St. Philadelphia, Broad and Arch Sts. Chicago, 54 Lake St.

# WELSBACH STREET LIGHTING COMPANY

OF AMERICA,

—OWNS, CONTROLS AND OPERATES—

EXCLUSIVELY

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STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

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**CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.**

NOW READY.

THE SIXTH (AND CENTENARY) EDITION

— OF THE —

# Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

**PRICE, - - $6.00.**

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

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# GAS ENGINES

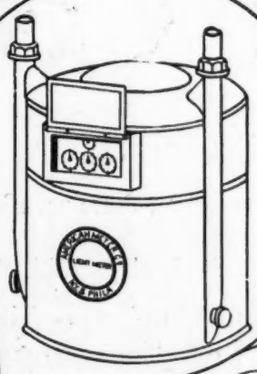
With Instructions for Care and Working of the Same.

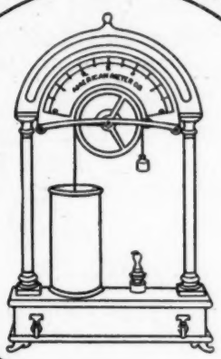
**By G. LIECKFELD, C.E.**

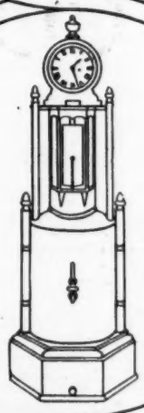
Translated with Permission of the author by GEO. M. RICHMOND, M.E.

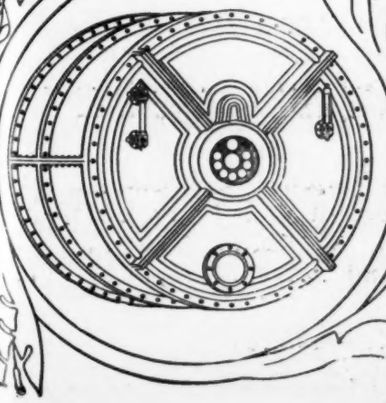
**Price, $1.00.**

**A. M. CALLENDER & CO., 32 Pine Street, New York.**









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**NEW YORK AND PHILADELPHIA,**

**CHICAGO, ST. LOUIS,**

**SAN FRANCISCO.**

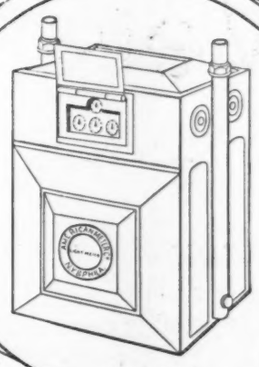
## PUBLIC LIGHTING TABLE.

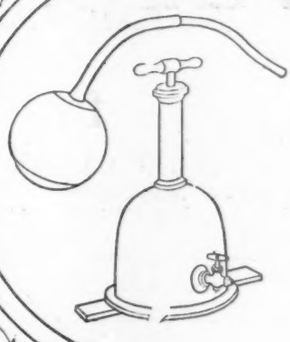
### NOVEMBER, 1899.

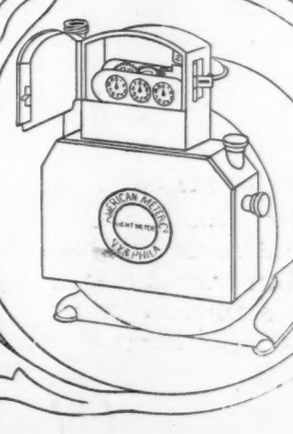
| Day of Week. | Date. | Table No. 1. Following the Moon. Light. | Table No. 1. Following the Moon. Extinguish. | Table No. 2. New York City. All Night Lighting. Light. | Table No. 2. New York City. All Night Lighting. Extinguish. |
|---|---|---|---|---|---|
| | | | | P.M. | A.M. |
| Wed. | 1 | 5.30 PM | 5.30 AM | 4.45 | 5.35 |
| Thu. | 2 | 5.30 NM | 5.30 | 4.45 | 5.35 |
| Fri. | 3 | 5.30 | 5.30 | 4.45 | 5.35 |
| Sat. | 4 | 5.30 | 5.30 | 4.45 | 5.35 |
| Sun. | 5 | 5.20 | 5.40 | 4.40 | 5.45 |
| Mon. | 6 | 5.20 | 5.40 | 4.40 | 5.45 |
| Tue. | 7 | 7.30 | 5.40 | 4.40 | 5.45 |
| Wed. | 8 | 8.40 | 5.40 | 4.40 | 5.45 |
| Thu. | 9 | 9.50 | 5.40 | 4.40 | 5 45 |
| Fri. | 10 | 11.00 FQ | 5.40 | 4.40 | 5.45 |
| Sat. | 11 | 12.10 AM | 5.40 | 4.40 | 5.45 |
| Sun. | 12 | 1.20 | 5.40 | 4.30 | 6.00 |
| Mon. | 13 | 2.30 | 5.40 | 4.30 | 6.00 |
| Tue. | 14 | 3.40 | 5.40 | 4.30 | 6.00 |
| Wed. | 15 | No L. | No L. | 4.30 | 6.00 |
| Thu. | 16 | No L. FM | No L. | 4.30 | 6.00 |
| Fri. | 17 | No L. | No L. | 4.30 | 6.00 |
| Sat. | 18 | 5.10 PM | 6.40 PM | 4.30 | 6.00 |
| Sun. | 19 | 5.10 | 7.40 | 4.25 | 6.00 |
| Mon. | 20 | 5.10 | 8.30 | 4.25 | 6.00 |
| Tue. | 21 | 5.10 | 9.30 | 4.25 | 6.00 |
| Wed. | 22 | 5.10 | 10.30 | 4.25 | 6.00 |
| Thu. | 23 | 5.10 | 11.30 | 4.25 | 6.00 |
| Fri. | 24 | 5.10 LQ | 12.30 AM | 4.25 | 6.00 |
| Sat. | 25 | 5.10 | 1.30 | 4.25 | 6.00 |
| Sun. | 26 | 5.10 | 2.30 | 4.20 | 6.10 |
| Mon. | 27 | 5.10 | 3.30 | 4.20 | 6.10 |
| Tue. | 28 | 5.10 | 4.30 | 4.20 | 6.10 |
| Wed. | 29 | 5.10 | 6.00 | 4.20 | 6.10 |
| Thu. | 30 | 5.10 | 6.00 | 4.20 | 6.10 |

### TOTAL HOURS LIGHTING DURING 1899.

| By Table No. 1. | Hrs. Min. | By Table No. 2. | Hrs. Min. |
|---|---|---|---|
| January | 215.40 | January | 423.20 |
| February | 184.40 | February | 355.25 |
| March | 187.40 | March | 355.35 |
| April | 166.50 | April | 298.50 |
| May | 158.00 | May | 264.50 |
| June | 140.50 | June | 234.25 |
| July | 150.30 | July | 243.45 |
| August | 168.30 | August | 280.25 |
| September | 179.50 | September | 321.15 |
| October | 213.20 | October | 374.30 |
| November | 217.00 | November | 401.40 |
| December | 238.10 | December | 433.45 |
| Total, yr. | 2221.00 | Total, yr. | 3987.45 |







OFFICE OF THE

# Welsbach Light Co.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23, 1899.

*To the Stockholders of the Welsbach Light Company:*

In answer to the many inquiries received from the stockholders as to whether the Welsbach Light Company is interested in the Kern Light or the Kern Incandescent Gas Light Company, I am authorized by the Board of Directors of this Company to advise you that **THIS COMPANY IS NOT NOW AND NEVER HAS BEEN INTERESTED IN EITHER THE KERN LIGHT OR THE KERN INCANDESCENT GAS LIGHT COMPANY. The Kern Light, or, to designate it more properly, the Kern Bunsen Burner for use with an incandescent mantle, and the United States patents upon which it is based, were offered to this Company, which refused to purchase them upon the advice of its experts, Dr. Charles F. Chandler, of Columbia College, and Dr. Waldron Shapleigh, its Chief Chemist, and of its Patent Council, Mr. John R. Bennett, of New York City.**

This Company is not now and never has been interested in the Welsbach Incandescent Gas Light Company of England, nor is that Company interested in this Company. Your attention is called to the following correspondence, which defines **THE POSITION OF THE UNITED GAS IMPROVEMENT COMPANY**, whose name is mentioned in the advertisements which offer for subscription the stock of the Kern Incandescent Gas Light Company.

WELSBACH LIGHT COMPANY,
W. E. BARROWS, President.

---

# WELSBACH LIGHT CO.,

BROAD AND ARCH STREETS,

PHILADELPHIA, PA., June 23d, 1899.

MR. THOMAS DOLAN, President the United Gas Improvement Company:

DEAR SIR: In yesterday's and to-day's New York and Philadelphia papers appear the advertisements of the International Banking and Trust Company soliciting subscriptions to the Capital Stock of the Kern Incandescent Gas Light Company. Among the names of the Directors of the said Trust Company published in the advertisements referred to appears the name of "George W. Elkins, United Gas Improvement Company, Philadelphia." As the United Gas Improvement Company has been prominently identified with the Welsbach Light ever since its introduction into the United States, the publication of its name in these advertisements, which also contain suggestions hostile to this Company, has greatly disquieted many of our shareholders. If you are willing to give me an authoritative statement of the position of the United Gas Improvement Company I shall be greatly obliged. Very truly yours,

W. E. BARROWS, President Welsbach Light Company.

**THE UNITED GAS IMPROVEMENT COMPANY,**
**Broad and Arch Sts., Philadelphia, June 23d, 1899.**

**COL. W. E. BARROWS, President Welsbach Light Company:**

**Dear Sir: Answering your favor of even date, the United Gas Improvement Company is not now and never has been interested either in the Kern Incandescent Gas Light Company or in the International Banking and Trust Company. Mr. George W. Elkins is neither an Officer nor a Director of the United Gas Improvement Company, and does not represent the United Gas Improvement Company. Very truly yours,**

**THOMAS DOLAN, President,**
**United Gas Improvement Company.**

# The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

## THE STANDARD JUNIOR,

## THE STANDARD DOUBLE SUPERHEATER,

## LOWE WATER GAS APPARATUS.

### Under Contract, 1899:

| | SETS. | DAILY CAPACITY. |
|---|---|---|
| Fostoria, O. | 1 | 250,000 Cubic Feet. |
| Derby, Conn. | 1 | 750,000 " |
| Lowell, Mass. | 1 | 1,000,000 " |
| Doylestown, Pa. | 1 | 50,000 " |
| Darby, Pa. | 1 | 400,000 " |
| Adrian, Mich. | 1 | 125,000 " |
| Concord, N. H. | 1 | 400,000 " |
| Sioux City, Iowa | 1 | 750,000 " |
| Standard Gas Light Co., New York | 3 | 5,400,000 " |
| Peekskill, N. Y. | 1 | 250,000 " |
| Westchester, N. Y. | 1 | 250,000 " |
| Jersey City, N. J. | 1 | 1,000,000 " |
| Stapleton, N. Y. | 1 | 750,000 " |
| London, O. | 1 | 125,000 " |
| Chicago, Ills. | 2 | 3,600,000 " |
| Putnam, Conn. | 1 | 125,000 " |
| Mansfield, O. | 1 | 250,000 " |
| Plymouth, Pa. | 1 | 125,000 " |
| Athens, Pa. | 1 | 125,000 " |
| Charlotte, N. C. | 1 | 250,000 " |
| Consolidated Gas Co., New York | 2 | 2,000,000 " |
| Quincy, Ills. | 1 | 250,000 " |
| Boone, Ia. | 1 | 125,000 " |
| Webster, Mass. | 1 | 50,000 " |
| Flushing, N. Y. | 1 | 250,000 " |
| Total | 29 | 18,650,000 " |
| Previously built | 294 | 187,100,000 " |
| Grand Total | 323 | 205,750,000 " |

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY, Sec.

**J. H. Gautier & Co.**

Greene & Essex Streets,
Jersey City, N. J.

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CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

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Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

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**Fire Brick Manufg. Co.,**

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

ESTABLISHED IN 1845.

**B. KREISCHER & SONS,**

Office, 119 E. 23d St., New York.

**Gas Retorts,**

*TILES, FIRE BRICK.*

AND EVERYTHING IN THE FIRE CLAY LINE.

**Adam Weber,**

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

**Works, Weber, N. J.**

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

**JAMES GARDNER, JR.,**

Successor to WILLIAM GARDNER & SON

Hamilton Building, Fifth Avenue,
PITTSBURGH, PA. P. O. Box 373.

**Fire Clay Goods for Gas Works.**

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

**HENRY MAURER & SON,**

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

**RETORT WORKS**

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

**Clay Gas Retorts,**

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

**GEROULD'S IMPROVED RETORT CEMENT**

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

*Price List, f.o.b. Galesburg or Mount Vernon.*

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD, Galesburg, Ills.

Eastern Agent, PERRY BORDEN, 19 Prospect Ave.,
MOUNT VERNON, N. Y.

**Parker-Russell Mining and Mfg. Co.,**

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

**Materials for Gas Companies**

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y
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**BALTIMORE**

**RETORT & FIRE BRICK CO.**

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

**Clay Retorts, Blocks & Tiles**

FIRE BRICK. FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 16x16x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

**PRACTICAL PHOTOMETRY.**

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00. A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

# National Gas and Water Company.

CONTRACTORS FOR
**Gas Plant Machinery**

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

**Gas Engineers**
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

# CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

**"IRON SPONGE."** Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

**AUTOMATIC GOVERNOR.**
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC COVERNOR IN THE WORLD!

**STEAM JET EXHAUSTER.** Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

**CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.**

## Hughes'
## "Gas Works,"

**Their Construction and Arrangement,**

**And the Manufacture and Distribution of Coal Gas.**

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

**Price, $1.65.**

**A. M. CALLENDER & CO.,**
**32 Pine St., N. Y. City.**

## The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N.Y City.

## The Chemistry of Illuminating Gas.

By NORTON H. HUMPH Price, $2.40.

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# Cyanogen.

**A PURIFYING MATERIAL FOR GAS.**

Soft and porous, it can be used in the natural state without any preparation, and it ensures perfect purification.

SPECIMENS AND PRICES ON APPLICATION.

**VAN BAARDA & CO.,**
MINE OWNERS,
**DUSSELDORF-ON-THE-RHINE.**

# Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

## PARSON'S TAR BURNER,

FOR USING COAL TAR AS FUEL.

## PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

**H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y.**

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

# THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

## Ocean Mine Youghiogheny Gas Coal,
## Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

## BERWIND-WHITE COAL MINING COMPANY'S

## Ocean Westmoreland Gas Coal.

**Offices:**
Washington Building, New York.
Betz Building, Philadelphia.

**STRICTLY** High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

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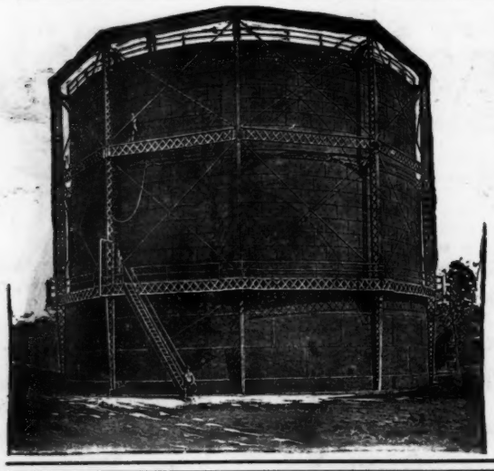

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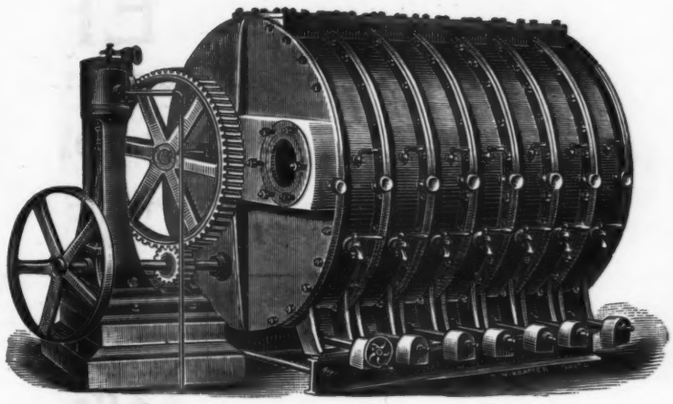

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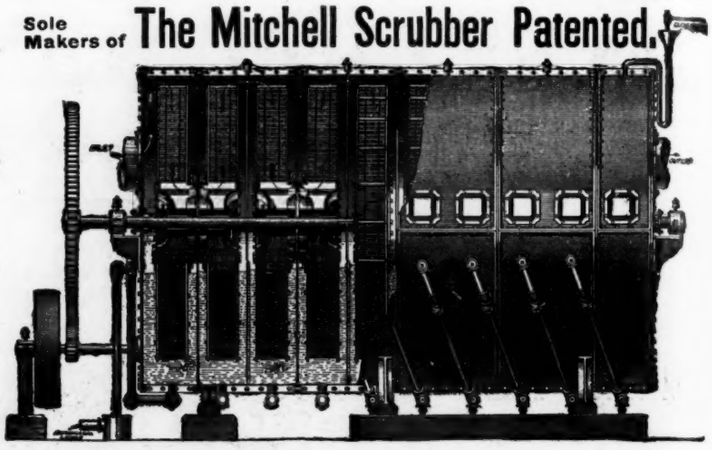

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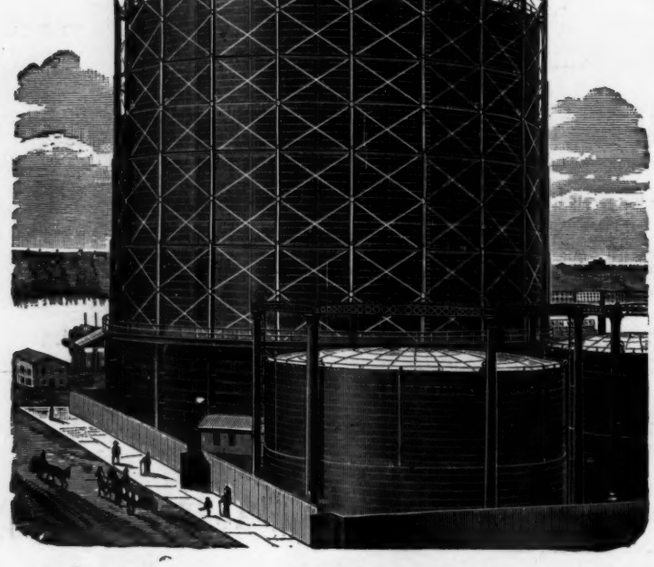

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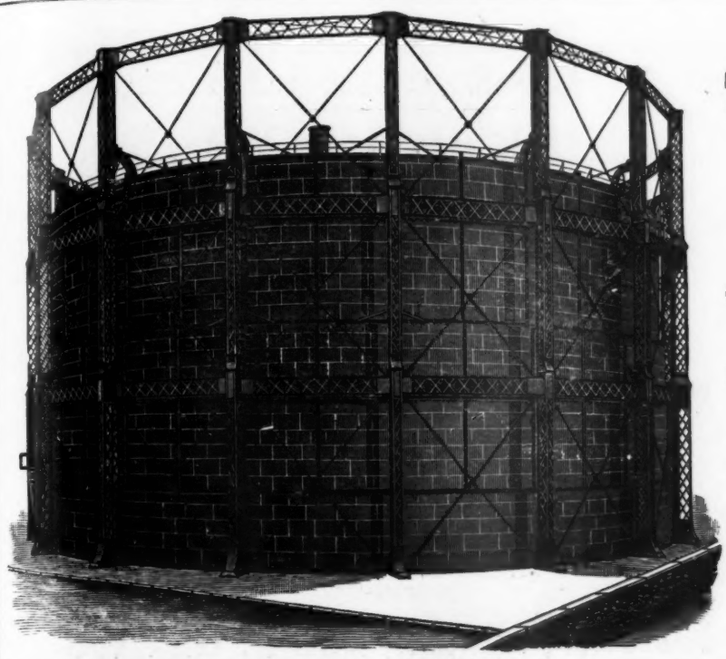

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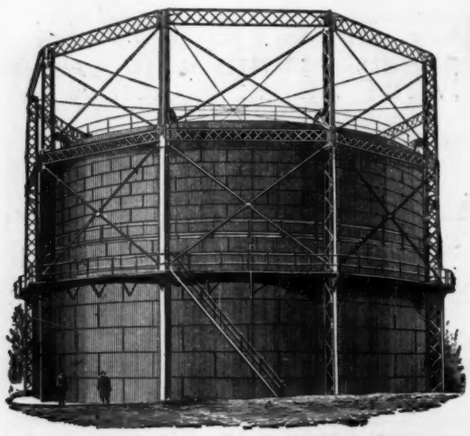

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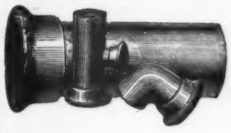

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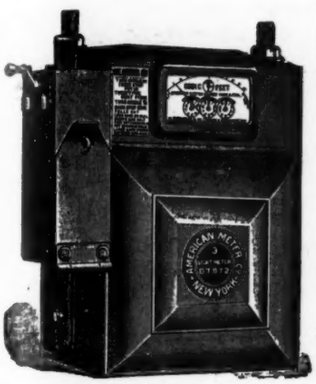

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